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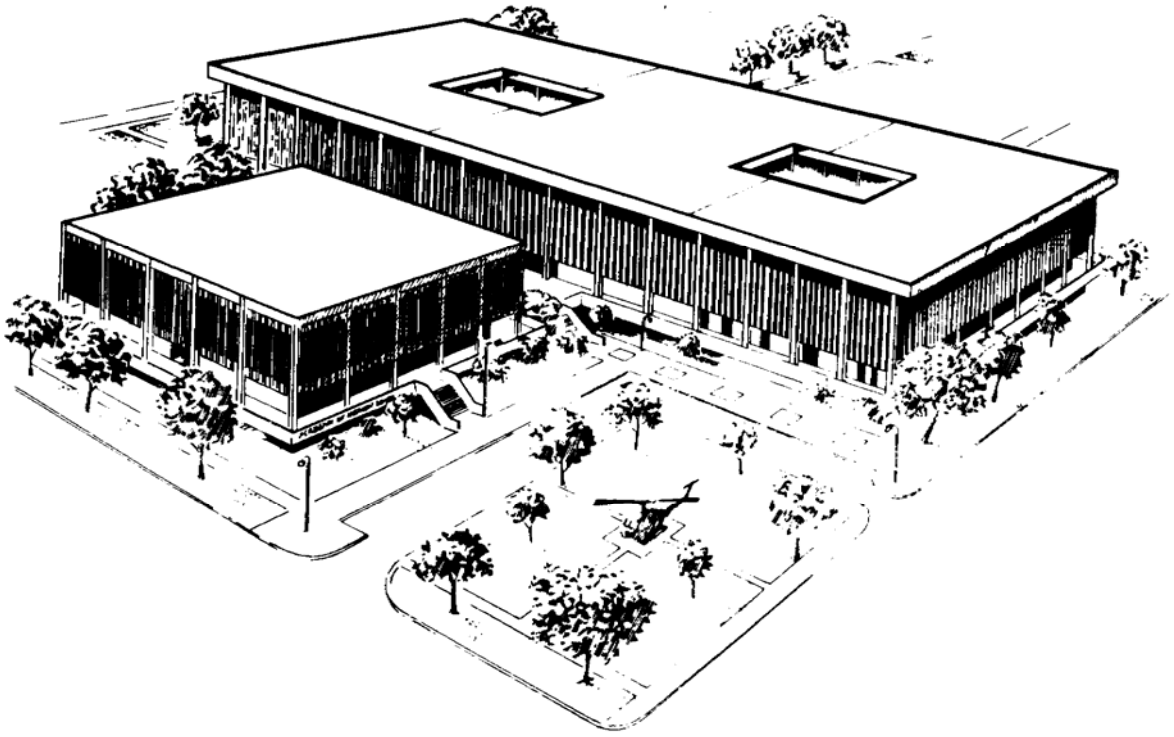
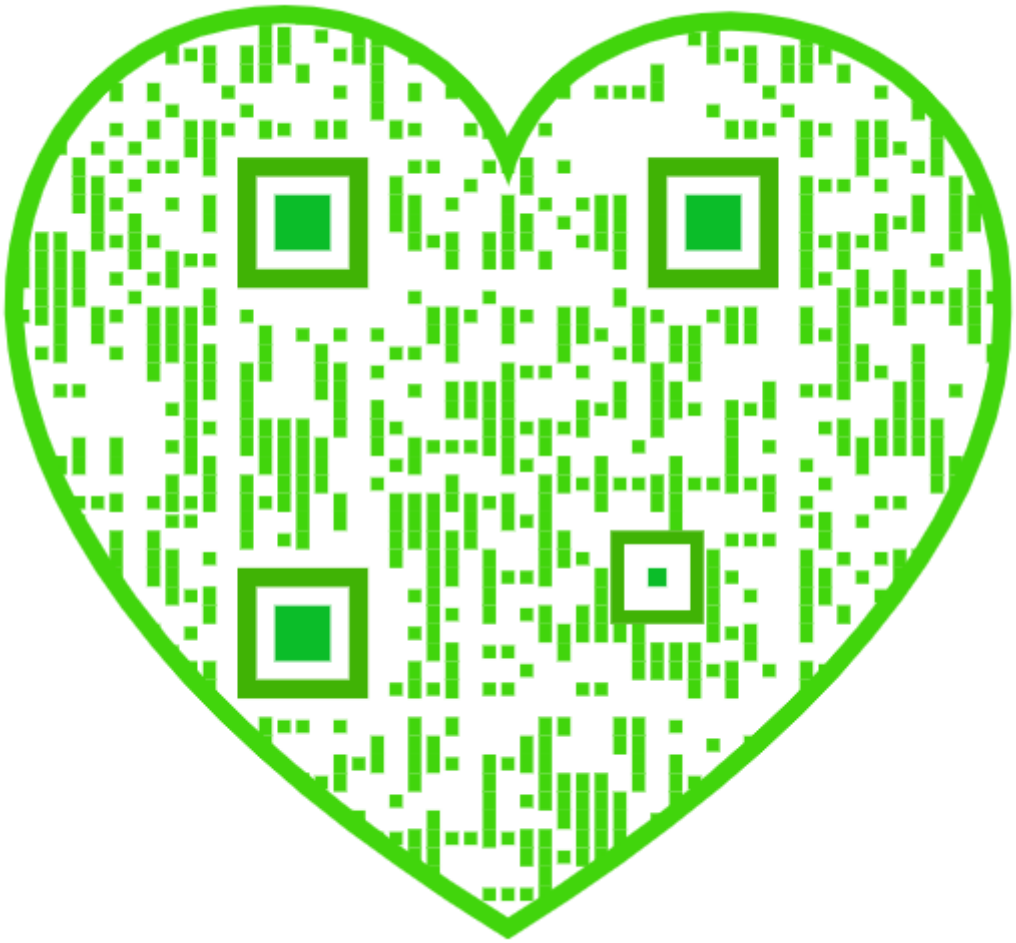


THE GASTROINTESTINAL SYSTEM

SUBCOURSE MD0581 EDITION 100



DEVELOPMENT

This subcourse is approved for resident and correspondence course instruction. It reflects the current thought of the Academy of Health Sciences and conforms to printed Department of the Army doctrine as closely as currently possible. Development and progress render such doctrine continuously subject to change.

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ADMINISTRATION

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CLARIFICATION OF TERMINOLOGY

When used in this publication, words such as "he," "him," "his," and "men" 'are intended to include both the masculine and feminine genders, unless specifically stated otherwise or when obvious in context.

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CORRESPONDENCE COURSE OF
THE U.S. ARMY MEDICAL DEPARTMENT CENTER AND SCHOOL

SUBCOURSE MD0581

THE GASTROINTESTINAL SYSTEM

INTRODUCTION

In this subcourse, you will study the gastrointestinal system. This system processes food so that it can be used by the body. Chemical reactions occur in each body cell. Some chemical reactions synthesize new enzymes, cell structures, bone, and other components of the body. Other chemical reactions release energy needed for the building processes. The foods we eat are usually too large to pass through the membranes of the body's cells. The organs of the gastrointestinal system break down food molecules for use by the cells of the body and eliminate the waste products the body cannot use. Knowledge of the gastrointestinal system is vitally important to most medical MOSs.

Subcourse Components:

The subcourse instructional material consists of seven lessons as follows:

Lesson 1, Anatomy and Physiology of the Digestive System.
Lesson 2, Physical Assessment of the Digestive System.
Lesson 3, Diseases and Disorders of the Gastrointestinal System
Lesson 4, Ingested Poisons.
Lesson 5, Nasogastric Intubation.
Lesson 6, Abdominal Trauma.
Lesson 7, Hepatitis.

Here are some suggestions that may be helpful to you in completing this subcourse:

--Read and study each lesson carefully.

--Complete the subcourse lesson by lesson. After completing each lesson, work the exercises at the end of the lesson, marking your answers in this booklet.

--After completing each set of lesson exercises, compare your answers with those on the solution sheet that follows the exercises. If you have answered an exercise incorrectly, check the reference cited after the answer on the solution sheet to determine why your response was not the correct one.

Credit Awarded:

Upon successful completion of the examination for this subcourse, you will be awarded 15 credit hours.

To receive credit hours, you must be officially enrolled and complete an examination furnished by the Nonresident Instruction Branch at Fort Sam Houston, Texas.

You can enroll by going to the web site http://atrrs.army.mil and enrolling under "Self Development" (School Code 555).

A listing of correspondence courses and subcourses available through the Nonresident Instruction Section is found in Chapter 4 of DA Pamphlet 350-59, Army Correspondence Course Program Catalog. The DA PAM is available at the following website: http://www.usapa.army.mil/pdffiles/p350-59.pdf.

LESSON ASSIGNMENT

LESSON 1	Anatomy and Physiology of the Digestive System.
LESSON ASSIGNMENT	Paragraphs 1-1 through 1-16.
LESSON OBJECTIVES	After completing this lesson, you should be able to:
	1-1. Identify the parts and structure of the alimentary canal.
	1-2. Identify the structure of the digestive system accessory organs.
	1-3. Describe the physiology of digestion.
SUGGESTION	After completing the assignment, complete the exercises of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 1

ANATOMY AND PHYSIOLOGY OF THE DIGESTIVE SYSTEM

Section I. ANATOMY OF THE DIGESTIVE SYSTEM

1-1. INTRODUCTION

a. **Food is Essential to Life.** Food is necessary for the chemical reactions that take place in every body cell; for example, formation of new enzymes, cell structures, bone, and all other parts of the body that give the energy to supply the body's needs. Most of the foods we eat are just too large to pass through the plasma membranes of the cells. The process of breaking down food molecules for the body's cells to use is called digestion, and the organs which work together to perform this function are termed the digestive system.

b. **Regulation of Food Intake.** How much food we eat is regulated by two sensations--hunger and appetite. When we crave food in general, we are experiencing hunger, and when we want a specific food, the correct term is appetite. The stronger of the two sensations is hunger which is accompanied by a stronger feeling of discomfort. The hypothalamus is the control center for food intake. There are a cluster of nerve cells in the lateral hypothalamus (the appetite center) which send impulses causing a person to want to eat. Another cluster of nerve cells tell the person he has had enough. These cells are located in the medial hypothalamus and called the satiety center. A person's food intake must be regulated to prevent the digestive tract from becoming too full. The upper digestive tract expands to let food enter the tract. Receptors in the walls of the digestive tract are stimulated and send signals to the satiety center, signals that tell the person he is full. He stops taking in food, and the contents of the digestive tract are digested.

c. **Digestive Processes.** Five basic activities help the digestive system prepare for use by the cells. These activities are ingestion, peristalsis, digestion, absorption, and defecation.

(1) Ingestion. Taking into the body of food, drink, or medicines by mouth.

(2) Peristalsis. Alternating contraction and relaxation of the walls of a tubular structure by which food is move along the digestive tract.

(3) Digestion. The processes by which food is broken down chemically and mechanically for the body's use. In chemical digestion, catabolic reactions break down protein, lipid, and large carbohydrate molecules we have eaten into smaller molecules which can be used by the body's cells. Mechanical digestion refers to the various movements which aid chemical digestion. Examples of such movements are the chewing of food by teeth and the churning of food by the smooth muscles of the stomach and the small intestine.

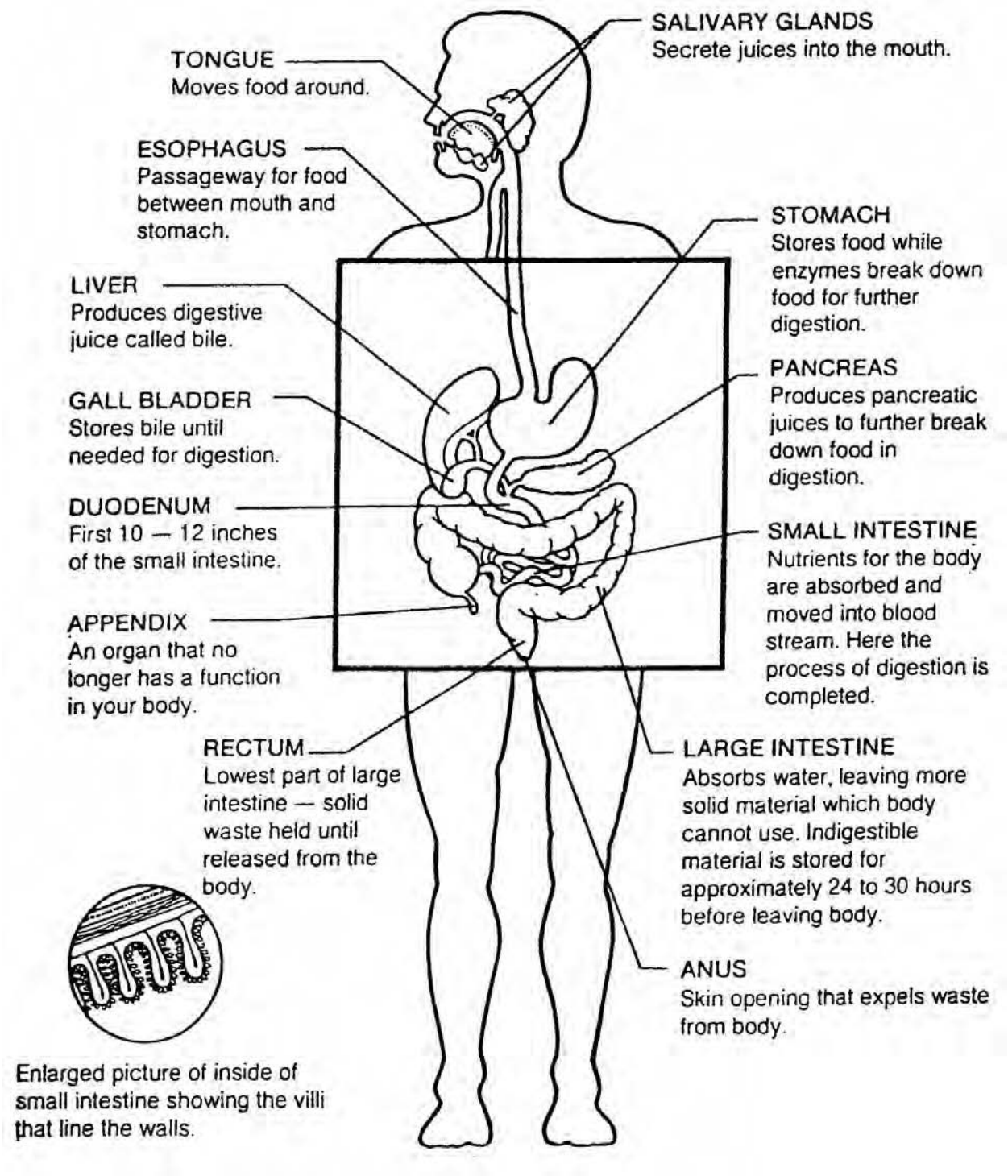

SALIVARY GLANDS
Secrete juices into the mouth.
TONGUE
Moves food around.
ESOPHAGUS
Passageway for food between mouth and stomach.
STOMACH
Stores food while enzymes break down food for further digestion.
LIVER
Produces digestive juice called bile.
PANCREAS
Produces pancreatic juices to further break down food in digestion.
GALL BLADDER
Stores bile until needed for digestion.
DUODENUM
First 10 — 12 inches of the small intestine.
SMALL INTESTINE
Nutrients for the body are absorbed and moved into blood stream. Here the process of digestion is completed.
APPENDIX
An organ that no longer has a function in your body.
RECTUM
Lowest part of large intestine — solid waste held until released from the body.
LARGE INTESTINE
Absorbs water, leaving more solid material which body cannot use. Indigestible material is stored for approximately 24 to 30 hours before leaving body.
ANUS
Skin opening that expels waste from body.
Enlarged picture of inside of small intestine showing the villi that line the walls.

Figure 1-1. The digestive system.

(4) Absorption. The taking up of digested food from the digestive tract into the cardiovascular and lymphatic systems for distribution to the body's cells.

(5) Defecation. The discharge of indigestible substances from the body.

d. **Organization of Digestive Organs.** The digestive organs are commonly divided into two main groups: the gastrointestinal (GI) tract (also called the alimentary canal) and the accessory structures.

(1) The gastrointestinal (GI) tract. The gastrointestinal tract is a continuous tube which extends from the mouth to the anus and which runs through the ventral body cavity. The tube is about 30 feet long in a cadaver and a little shorter in a living person because the tube's wall muscles are toned. From the time food is eaten until it is digested and eliminated, it is in the gastrointestinal tract. Muscular contractions in the walls of the GI tract churn the food breaking it into usable molecules. The organs which make up the gastrointestinal tract are the mouth, pharynx, esophagus, stomach, small intestine, and large intestine. These organs are sometimes referred to as the primary organs of the digestive system.

(2) Accessory structures. These structures include the teeth, tongue, salivary glands, liver, gallbladder, and pancreas. Except for the teeth and the tongue, all the structures lie outside the continuous tube which is the gastrointestinal tract. Secretions that aid in the chemical breakdown of food are produced and stored by these structures. Eventually, such secretions are released into the GI tract through ducts in the body.

(3) General histology (structure of tissues). The gastrointestinal wall has the same basic tissue arrangement from the mouth to the anus. There are four coats (also called tunics): the mucosa, submucosa, muscularis, and serosa (adventitia). The mucosa, the inner tissue layer, contains blood and lymph vessels which carry nutrients to other tissues and also protects the rest of the body against disease. The submucosa is made up of loose connective tissue and binds the mucosa to the next layer which is the muscularis. Skeletal muscle in the muscularis of the mouth, pharynx, and esophagus produce voluntary swallowing. The outer layer of tissue is the serosa.

NOTE: Remember that the GI tract carries food which often contains bacteria.

1-2. MOUTH--PRIMARY ORGAN

a. The mouth is also referred to as the oral cavity or the buccal cavity. This organ is formed by the cheeks, the hard palate, the soft palate, and the tongue. The lips and the teeth are also considered part of the mouth.

b. The lips, fleshy folds surrounding the opening of the mouth, are covered on the outside by skin and on the inside by a mucous membrane. Cheeks, forming the lateral boundaries of the mouth, are muscular structures covered on the outside by skin and lined with squamous epithelium. The hard palate consists of portions of the two maxillae bones and the two palatine bones. The soft palate is fashioned by muscle and contains the uvula (the cone-shaped, fleshy mass of tissue hanging from the soft palate above the back of the tongue). The tongue is a solid mass of skeletal muscle that contains the sensations of taste. The teeth are the organs of mastication (the process of chewing food). Refer to figure 1-1 for position of the mouth.

1-3. PHARYNX (THROAT)--PRIMARY ORGAN

a. The pharynx, more commonly called the throat, is a funnel-shaped tube which starts at the internal nares and runs about five inches down the neck. It lies just behind the nasal cavity and oral cavity and just in front of the cervical vertebrae. Skeletal muscles make up the wall of the pharynx along with a mucous membrane.

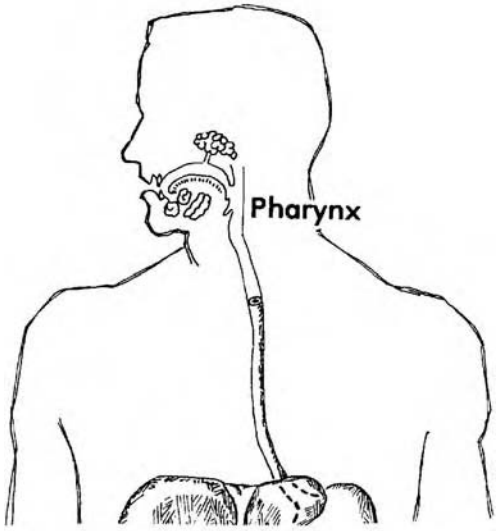


Figure 1-2. The pharynx.

b. The pharynx has three anatomical divisions: The nasopharynx, the oropharynx, and the laryngopharynx. This organ is a common passageway for both the respiratory and digestive systems.

1-4. ESOPHAGUS--PRIMARY ORGAN

a. The esophagus is a muscular, collapsible tube which is about ten inches long. It lies behind the trachea and extends from the pharynx to the stomach. See figure 1-1 for position of the esophagus.

b. The esophagus can be divided into thirds according to its composition. The upper third of the esophagus is made up of striated (striped) muscle. The middle third has striated and smooth muscle, and the lower third has smooth muscle.

1-5. STOMACH--PRIMARY ORGAN

a. The stomach is a musculomembranous, J-shaped enlargement of the alimentary canal and is located between the esophagus and the duodenum. See figure 1-1 for the position of the stomach. The stomach is divided into three parts: the fundus, the body, and the pylorus. The fundus is the upper rounded portion of the stomach located above and to the left of the cardia. The body of the stomach is the large central portion which is located below the fundus. The pylorus is the narrow, inferior region of the stomach. In every person, the position and size of the stomach vary continually. For example, the diaphragm pushes the stomach down each time a person breathes in and pulls the stomach up each time a person breathes out. When the stomach is empty, it is about the size of a large sausage, but when an individual eats a large amount of food, the stomach stretches as necessary and may become very large.

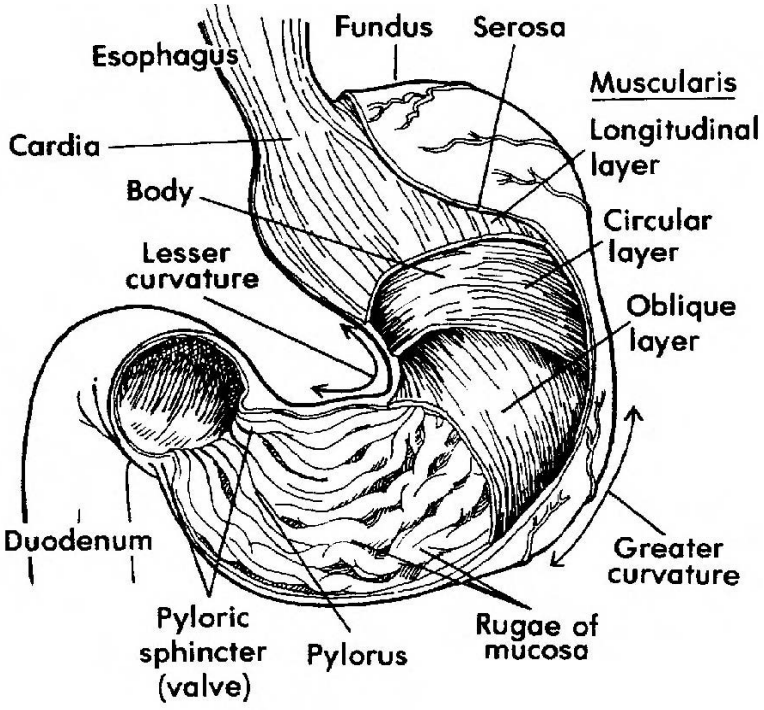


Figure 1-3. Stomach.

b. The cardiac sphincter muscle guards the opening between the esophagus and the stomach. The pyloric sphincter muscle guards the opening between the stomach and the small intestine. The stomach contains glands called gastri pits which are lined with secreting cells. The zymogenic cells (the chief cells) secrete the substance pepsinogen. During the digestive process, pepsinogen comes in contact with hydrochloric acid (produced by the stomach parietal cells) creating the principal gastric enzyme pepsin.

NOTE: The cardiac sphincter cannot perform its functions when an individual is intubated.

1-6. SMALL INTESTINE--PRIMARY ORGAN

a. The major parts of the process of digestion and absorption take place in the small intestine. This organ is a tube about one inch in diameter and 20 feet long. Refer to figure 1-1 for position of the small intestine.

b. There are three major divisions in this organ: the duodenum, the jejunum, and the ileum. The duodenum, about ten inches long, is the upper-most part of the small intestine and is attached to the pyloric end of the stomach. The jejunum, about eight feet long, begins at the point where the small intestine turns abruptly forward and downward. The ileum, the third part of the small intestine, is about 12 feet long. Villi, finger-like projections from the membrane covering the inside of the small intestine, increase the surface area of the intestinal wall. This allows larger amounts of digested nutrients to move into the wall of the small intestine.

1-7. LARGE INTESTINE--PRIMARY ORGAN

a. The large intestine is the broad, shorter part of the intestines. This tube-shaped organ has a diameter of about two and one half inches and is about five to six feet long. The large intestine extends from the ileum to the anus. See figure 1-1 for position of the large intestine.

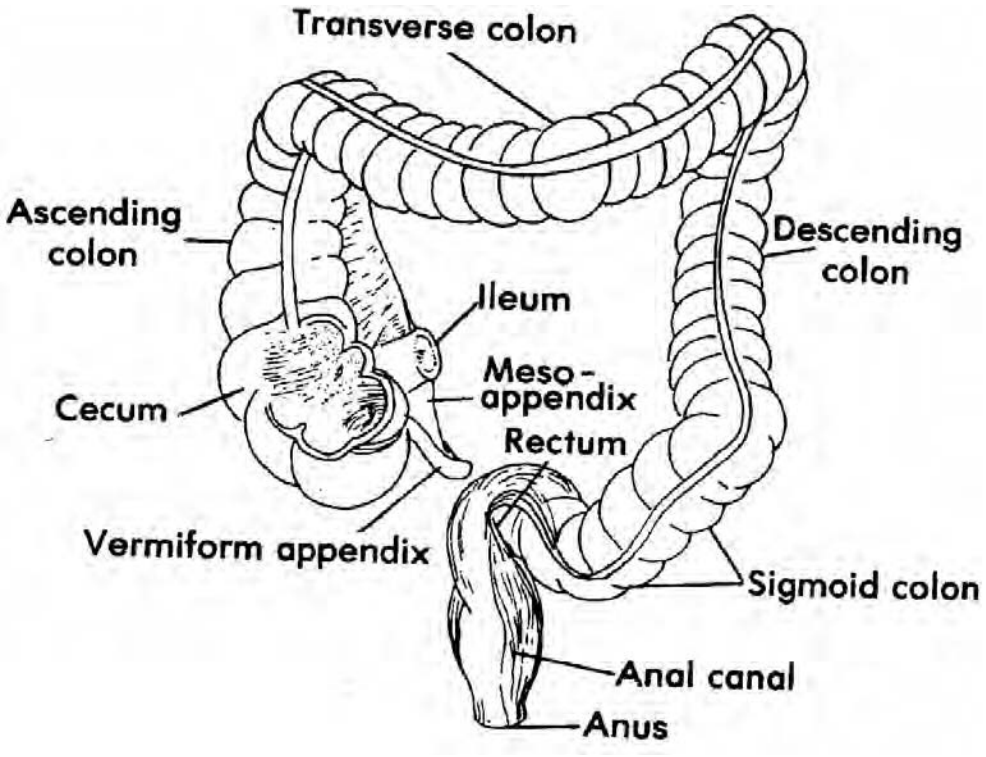


Figure 1-4. Large intestine.

b. The large intestine consists of three divisions: the cecum, the colon, and the rectum. The cecum is the first two or three inches of this organ. The colon begins at the open end of the cecum and is further divided into four parts: the ascending colon, the transverse colon, the descending colon, and the sigmoid colon. The ascending colon comes down on the right side of the abdomen, reaches the undersurface of the liver, and turns abruptly to the left. As the large intestine continues across the abdomen to the left side, it becomes the transverse colon. The intestine then curves beneath the lower end of the spleen on the left side and is called the descending colon. The sigmoid colon is the intestine continuing and projecting inward to the midline of the body and ending as the rectum at about the level of the third sacral vertebra. The rectum is about the last seven or eight inches of the large intestine. The last one inch of the rectum is the anal canal. The opening of the anal canal is guarded by an internal sphincter of smooth muscle and an eternal sphincter of skeletal muscle. The anal canal's opening to the outside is called the anus, an opening usually closed except during the elimination of the wastes of digestion.

1-8. SALIVARY GLANDS--ACCESSORY ORGANS

a. The salivary glands are accessory structures that lie outside the mouth. These glands secrete the major portion of saliva, the fluid that keeps the membranes of the mouth moist. Saliva glands empty the saliva into ducts that let their contents flow into the mouth. Refer to figure 1-1 for general position of the salivary glands.

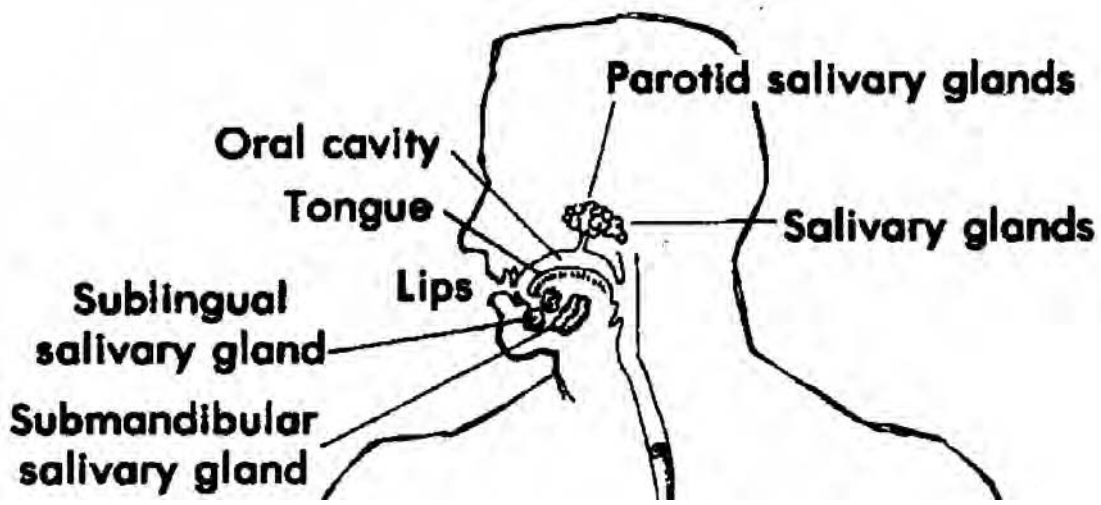


Figure 1-5. Salivary glands.

b. These glands appear in pairs in three locations. The largest pair of salivary glands are the parotid glands which are located below each external ear. The submandibular glands are each located toward the back under the mucous membrane which covers the floor of the mouth under the tongue. The sublingual glands, the smallest of the salivary glands, are located toward the front of the mouth from the submandibular glands.

1-9. LIVER--ACCESSORY ORGAN

a. The liver is the largest gland in the body. It weighs three to four pounds. There are two principal lobes in the liver: the left lobe and the right lobe. The left lobe forms one-sixth of the liver mass. The right lobe has several subdivisions: the right lobe proper and two small lobes associated with it. Those smaller lobes are the caudate lobe and the quadrate lobe.

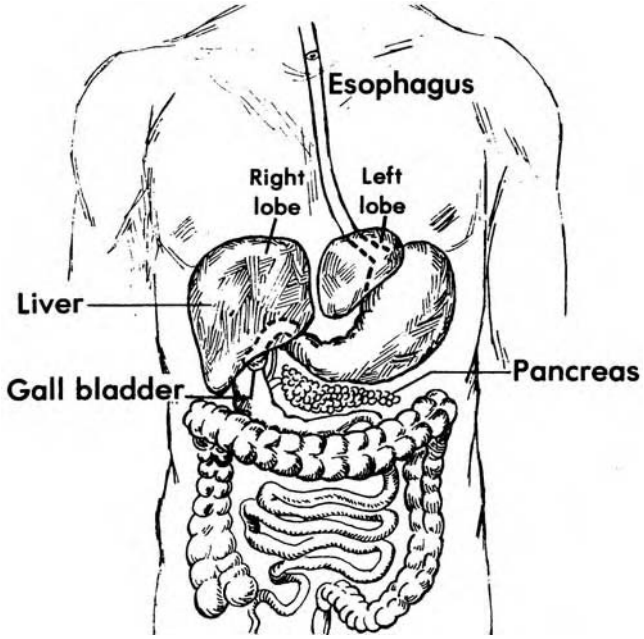


Figure 1-6. The liver.

b. The liver is connected to the small intestine by a series of ducts which are important passageways. The right and left hepatic ducts come from under the surface of the liver to form the common hepatic duct. The common hepatic duct joins with the cystic duct of the gallbladder to form the common bile duct which empties into the duodenum.

1-10. GALLBLADDER--ACCESSORY ORGAN

a. The gallbladder is a pear-shaped sac which is about three to four inches long. This organ is located under the liver. Bile pours into and comes out of the liver by way of the cystic duct. The gallbladder serves as a storage sac for excess bile which is concentrated five to ten times normal strength while in this organ. See figure 1-1 for position of the gallbladder.

b. The wall of the gallbladder is made up of an inner muscular layer, a middle, muscular coat, and an outer coat. The inner muscular layer consists of mucous membranes arranged in large folds similar to the empty stomach lining. The middle muscular coat is made up of smooth muscle fibers, and the outer coat is the visceral peritoneum (the outer covering for internal organs of the body).

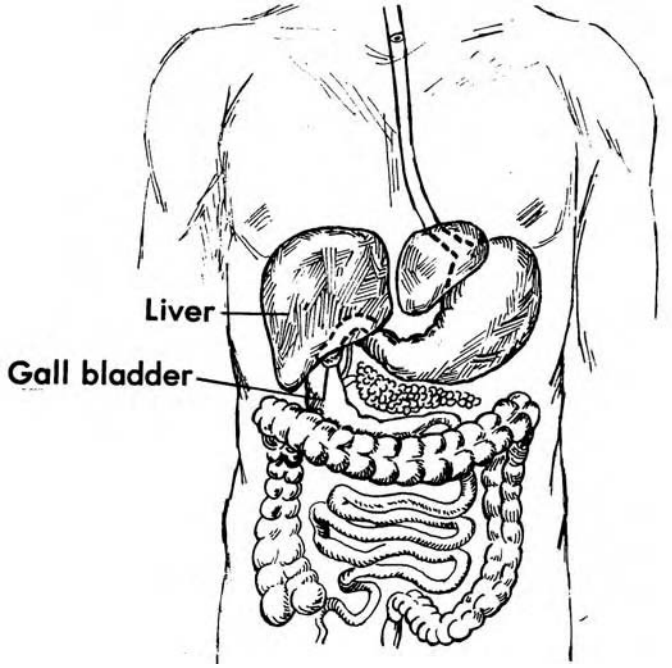


Figure 1-7. The gallbladder.

1-11. PANCREAS--ACCESSORY ORGAN

a. The pancreas lies behind the greater curve of the stomach and is connected by a duct or two ducts to the duodenum. This organ is soft and oblong, about six inches long and one inch thick. See figure 1-1 for position of the pancreas.

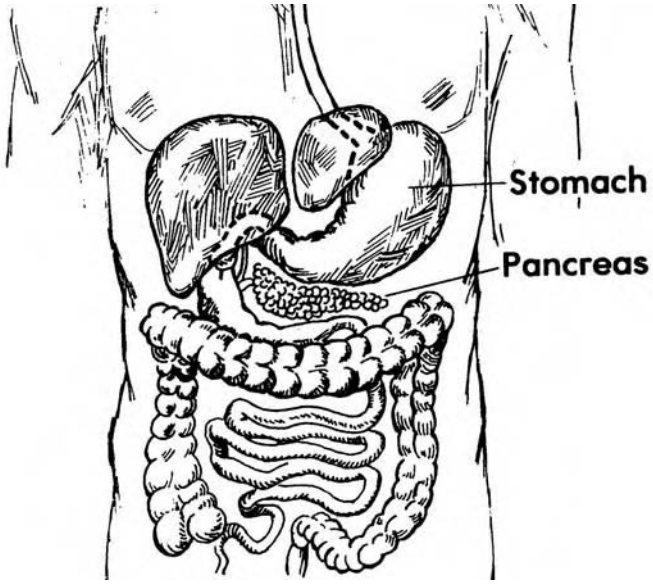


Figure 1-8. The pancreas.

b. The pancreas, linked to the small intestine by a series of small ducts, is made up of exocrine cells and endocrine cells. Exocrine cells empty their products into the pancreas duct network. Endocrine cells distribute their products into the circulatory system. Another name for endocrine cells is islands or islets of Langerhans. Endocrine cells make up about two percent of the total pancreas mass and are made up of alpha, beta, and delta cells that secrete hormones.

1-12. APPENDIX--ACCESSORY STRUCTURE

The appendix is attached to the cecum of the large intestine. This organ is a worm-like structure that has no functional importance in the digestive process. See figure 1-1 for position of the appendix.

Section II. FUNCTIONS AND STAGES OF THE DIGESTIVE PROCESS

1-13. MECHANICAL AND CHEMICAL DIGESTION

There are two major types of digestion: mechanical digestion and chemical digestion. Mechanical digestion refers to the various movements that help food move through the digestive system. Chemical digestion refers to the series of catabolic reactions (here, the breakdown of bonds of food molecules to release energy) that break down large carbohydrate, lipid, and protein molecules which are in the food we have eaten. The broken down molecules are used by the cells of the body to produce energy.

a. **Mouth.** Both mechanical digestion and chemical digestion take place in the mouth.

(1) Mechanical digestion. The first step in mechanical digestion in the mouth is mastication, more commonly called chewing. The tongue moves food around in the mouth, the teeth chew the food, and food is mixed with saliva during this process. The result is that food is reduced to a soft, flexible mass called a bolus. The second mechanical function that occurs in the mouth is deglutition, also called swallowing. In swallowing, the tongue moves the bolus upward and backward against the palate forcing the bolus to the back of the mouth cavity and into the oropharynx (a voluntary stage of swallowing). Next, the involuntary pharyngeal stage of swallowing takes place, and the bolus passes through the pharynx and enters the esophagus. Note that the tongue is important in both mastication and deglutition.

(2) Chemical digestion. Only one chemical digestive process occurs in the mouth. The enzyme salivary amylase begins the breakdown of starch. The function of this enzyme is to aid in the breakdown of carbohydrates. Most food is swallowed too quickly for it to be broken down to substances which the body can use. The enzyme salivary amylase continues to act on starches in the food for 15 to 20 minutes while the food is in the stomach.

b. **Pharynx.** The pharynx contributes to the digestive process by deglutition. The wall of the pharynx contains three pharyngeal constrictor muscles. By wave-like contractions, these muscles force the food mass (the bolus) down into the beginning of the esophagus.

c. **Esophagus.** Two processes contribute to digestion in the esophagus: mechanical digestion and peristalsis. The functions of the esophagus are to secrete mucus and transport food to the stomach. The process of deglutition continues as the bolus continues on its way to the stomach. The involuntary muscular movements of peristalsis which are wave-like movements squeeze food downward; through the esophagus. This is the process of esophageal peristalsis:

(1) The circular muscles just above the bolus contract causing the esophagus to become narrower thus pushing the bolus down the esophagus.

(2) The section of the esophagus just below the bolus adjust to make the esophagus under the bolus widen to accept this food mass.

(3) These muscles continue in waves to contract continually pushing the food mass toward the stomach.

(4) At the same time, glands in the esophagus secrete mucus which also helps the food mass move through the esophagus.

NOTE: Solid or semisolid food usually moves from the mouth to the stomach in from four to eight seconds. Very soft foods and liquids pass from the mouth to the stomach in about one second.

d. **Stomach.** Both mechanical digestion and chemical digestion take place in the stomach.

(1) Mechanical digestion. The food mass enters the stomach, and several minutes later mixing waves pass over the stomach. These are gentle, rippling peristaltic movements which pass over the stomach every 15 to 25 seconds when there is food in the stomach. The movement of these waves mixes the food with the secretions of the gastric glands, softening the food mass, and reducing it to a thin liquid called chyme (pronounced kim). The fundus portion of the stomach is mainly a storage area, and few mixing waves take place there. Foods may be stored is the fundus for an hour or more without becoming mixed with gastric juice. During this storage time, salivary digestion continues. The food progresses through the stomach from the fundus to the body where the mixing waves become stronger and even stronger as the food reaches the pylorus. At the pylorus, each mixing wave forces a small amount of the stomach contents into the duodenum. Most of the food is forced back into the body of the

stomach where further chemical digestion takes place. Another mixing wave pushes another small amount of the contents of the stomach into the duodenum. This continuous forward and backward movement of the stomach contents results in a thorough mixing of the food with the secretions of the gastric glands.

(2) Chemical digestion. The main chemical activity of the stomach is to begin the digestion of proteins. Gastrin, a hormone produced by the stomach, stimulate the secretion of gastric juices, primarily hydrochloric acid. Hydrochloric acid activates the production of pepsinogen which in turn becomes pepsin. Pepsin starts a chemical breakdown of proteins.

e. **Small Intestine.** Mechanical digestion and chemical digestion take place in the small intestine. In fact, the major part of digestion and absorption occurs in the small intestine.

(1) Mechanical digestion. The two main mechanical digestive processes which take place in the small intestine are segmentation and peristalsis. Segmentation is a forward and backward movement of food within a particular segment of the small intestine. The food is not being moved forward but is being thoroughly mixed with digestive juices and intestinal mucosa. (The intestinal mucosa makes absorption easier.) Peristalsis, the second mechanical process, propels the chyme onward through the intestinal tract. Peristaltic contractions in the small intestine are much weaker than those in the esophagus or stomach. Chyme remains in the small intestine for from three to five hours because chyme moves through this organ at a slow rate of one centimeter per minute.

(2) Chemical digestion. When fats, carbohydrates, and acids pass through the pyloric sphincter, the chemical digestive process in the small intestine begins. The chyme which enters the small intestine is made up of partly digested carbohydrates, partially digested proteins, and largely undigested lipids (a group of fat and fat-like substances which are a source of the body's fuel). These carbohydrates, proteins, and lipids finish the process of digestion in the small intestine. Fats, carbohydrates, and acids passing through the pyloric sphincter trigger the release of hormones from the intestinal mucosa. One of these hormones inhibits gastric secretions produced by the liver and also inhibits motility. Two other hormones stimulate the flow of bile and pancreatic juices that help in the emulsifying of fats and the chemical breakdown of carbohydrates.

f. **Large Intestine.** The chief functions of the large intestine are to finish the job of absorption, make certain vitamins, form feces, and expel feces from the body. Both mechanical digestion and chemical digestion work to perform these functions.

(1) Mechanical digestion. Remember that the large intestine is composed of the cecum, the colon, and the rectum. After an individual eats a meal, the peristaltic wave-like motions in the ileum (the lower part of the small intestine) become stronger forcing chyme from the ileum into the cecum (the first part of the large intestine). Chyme continues its journey filling the cecum and then moving into the colon. In the colon, mass peristalsis, a stronger peristaltic wave, drives the contents of the colon into the rectum. When the rectum is full, pressure receptors in its walls activate the defecation reflex which causes the contents of the rectum to be eliminated.

(2) Chemical digestion. Bacterial action rather than the action of enzymes completes the last stage of digestion, a stage which is completed in the large intestine. Glands in the large intestine secrete mucus, and bacteria prepare the undigested remainder of chyme for eventual elimination. Bacteria causes any remaining carbohydrates to ferment releasing hydrogen, carbon dioxide, and methane gas in the fermentation process. These gases contribute to gas in the colon. Bacteria also act on any proteins which remain changing them to amino acids and breaking down amino acids into simpler substances. Some of these simpler substances are carried off in the feces and contribute to fecal odor. The brown color of feces is the result of bacteria decomposing bilirubin (an orange pigment) to a simpler pigment. Several vitamins necessary for normal metabolism including some B vitamins and vitamin K are the result of bacterial actions in the large intestine.

1-14. ABSORPTION

a. **General**. Absorption is the passage of substances (water, salts, vitamins, carbohydrates, proteins, and fats) through the intestinal mucosa of the villi into the blood or lymph. The chemical and mechanical phases of digestion are focused on changing food into forms that can go through the epithelial cells which line the mucosa and into the blood and lymph vessels underneath. Most absorption takes place in the small intestine; actually, 90 percent of nutrients are absorbed in the small intestine. The other 10 percent of absorption takes place in the stomach and the large intestine.

b. **Proteins.** Most proteins are absorbed in the form of amino acids, and absorption takes place mainly in the duodenum and the jejunum. As amino acids, proteins move into the epithelial cells of the villi. Amino acids move out of these cells and enter the bloodstream.

c. **Carbohydrates.** Most carbohydrates are absorbed as simple sugars (monosaccharides). They move into the epithelial cells of the villi, then to the capillaries of the villi, next to the bloodstream and into the liver, through the heart, and into general circulation in the body.

d. **Water.** Each day about nine quarts of water enter the small intestine. This fluid is composed of liquid intake and various gastrointestinal secretions. The small intestine absorbs roughly eight quarts of this water. The remainder of the water passes into the large intestine where most of the water is absorbed. The small intestine absorbs water by osmosis through epithelial cells and into the blood capillaries of the villi (small hair-like projections from the surface of mucous membranes). Water is normally absorbed at the rate of 200 to 400 ml/hour.

e. **Electrolytes.** The small intestine absorbs electrolytes which are parts of gastrointestinal secretions. This organ also absorbs electrolytes from ingested foods and liquids. Absorption again takes place through the villi in the small intestine.

f. **Salts.** Salts are absorbed by the villi in the large intestine.

g. **Vitamins.** The small intestine absorbs fat-soluble vitamins such as vitamins A, D, E, and K. The majority of water-soluble vitamins are absorbed by diffusion.

1-15. ELIMINATION

Certain parts of food resist digestion and are eliminated from the intestines in the feces. These residues of digestion include cellulose from carbohydrates, undigested connective tissue, and toxins from meat proteins and undigested fats. Additionally, feces contain bacteria, pigments, water, and mucus.

1-16. CLOSING

The feeding of each tissue is critical to growth and maintenance of the body. When this system is disrupted, the body cannot maintain itself. The understanding of the anatomy and physiology of this system will help you develop the concepts necessary to anticipate the problems disease or trauma may cause.

Continue with Exercises

EXERCISES, LESSON 1

INSTRUCTIONS. Answer the following exercises by writing the answer in the space provided.

After you have completed all of these exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. The process of breaking down food molecules for the body's cells to use is called

   _____.

2. Name the two sensations which regulate the amount of food human's eat.

   a. _____.

   b. _____.

3. Why must a person's food intake be regulated? _____

   _____

4. The continuous tract which extends from the mouth to the anus and which runs through the ventral body cavity is called the _____.

5. Another name for the alimentary canal is the _____.

6. List the organs which make up the gastro-intestinal tract.

   a. _____.

   b. _____.

   c. _____.

   d. _____.

   e. _____.

7. List the accessory structures of the digestive system.

   a. _____.

   b. _____.

   c. _____.

   d. _____.

   e. _____.

   f. _____.

8. List the four coats or layers of the walls of the gastrointestinal tract.

   a. _____.

   b. _____.

   c. _____.

   d. _____.

9. Another name for the structure of tissues is _____.

10. List the six body parts which form the mouth.

    a. _____.

    b. _____.

    c. _____.

    d. _____.

    e. _____.

    f. _____.

11. The pharynx is a common passageway for two body systems: the _____ system and the _____ system.

12. The collapsible tube which lies just below the pharynx is the _____.

13. The three parts of the _____ are the body, the fundus, and the pylorus.

14. The duodenum, the jejunum, and the villi are parts of the primary organ, _____.

15. The organ which extends from the ileum to the anus is the _____.

16. Name the three pairs of salivary glands.
    a. _____.
    b. _____.
    c. _____.

17. The largest organ in the body is the _____.

18. The organ which acts as a storage sac for excess bile is the _____.

19. The _____ is composed of exocrine cells and endocrine cells.

20. The organ which is a worm-like structure with no apparent function is the _____.

21. _____ digestion is the series of catabolic reactions which break down large carbohydrate, lipid, and protein molecules so that the cells can use these molecules to produce energy.

22. _____ digestion refers to the various movements that help food move through the digestive system.

23. The wave-like movements which push the food mass (the bolus) through the esophagus are called esophageal _____.

24. How long does it take for solid or semisolid food to move from the mouth to the stomach? _____.

25. The passage of water, salts, vitamins, carbohydrates, proteins, and fats through the intestinal mucosa of the villi into the blood or lymph is termed _____.

26. List three types of matter discharged from the body in the feces.

    a. _____.

    b. _____.

    c. _____.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 1

1. Digestion. (para 1-1a)

2. Hunger.
   Appetite. (para 1-1b)

3. To prevent the digestive tract from becoming too full. (para 1-1b)

4. Gastrointestinal tract. (para 1-1d(1))

5. Gastrointestinal tract. (para 1-1d)

6. Mouth.
   Pharynx.
   Esophagus.
   Stomach.
   Small intestine.
   Large intestine. (para 1-1d(1))

7. Teeth.
   Tongue.
   Salivary glands.
   Liver.
   Gallbladder.
   Pancreas. (para 1-1d(2))

8. Mucosa.
   Submucosa.
   Muscularis.
   Serosa. (para 1-1d(3))

9. Histology. (para 1-1d(3))

10. Lips.
    Cheeks.
    Hard palate.
    Soft palate.
    Tongue.
    Teeth. (para 1-2b)

11. Digestive.
    Respiratory. (para 1-3b)

12. Esophagus. (para 1-4a)

13. Stomach. (para 1-5a)

14. Small intestine. (para 1-6b)

15. Large intestine. (para 1-7a)

16. Parotid glands.
Submandibular glands.
Sublingual glands. (para 1-8b)

17. Liver. (para 1-9a)

18. Gallbladder. (para 1-10a)

19. Pancreas. (para 1-11b)

20. Appendix (para 1-12)

21. Chemical. (para 1-13)

22. Mechanical. (para 1-13)

23. Peristalsis. (para 1-13c)

24. Four to eight seconds. (para 1-13c, NOTE)

25. Absorption. (para 1-14a)

26. You are correct if you listed any three of the following:

    Cellulose from carbohydrates.
    Undigested connective tissue.
    Toxins from meat proteins and undigested fats.
    Bacteria.
    Pigments.
    Water.
    Mucus. (para 1-15)

End of Lesson 1

LESSON ASSIGNMENT

LESSON 2	Physical Assessment of the Digestive System.
LESSON ASSIGNMENT	Paragraphs 2-1 through 2-5.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

2-1. Identify the factors for consideration in the patient history-taking process.

2-2. Identify the physical assessment techniques to be followed when conducting a physical assessment of the mouth and pharynx.

2-3. Identify the anatomical landmarks and quadrants of the abdomen.

2-4. Identify the techniques used in an abdominal examination and the order of the techniques.

2-5. Identify abnormalities which may be found during an examination of the abdomen.

2-6. Identify the physical assessment techniques to be followed when conducting a physical assessment of the rectal area.

SUGGESTION After completing the assignment, complete the exercises of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 2

PHYSICAL ASSESSMENT OF THE DIGESTIVE SYSTEM

2-1. INTRODUCTION

As a Medical NCO, you will frequently encounter patients who exhibit signs and symptoms of gastrointestinal disease or trauma. In this lesson, you will gain a familiarization with techniques and tools of conducting a physical assessment of the digestive system. Your ability to adequately perform an evaluation could be critical for the patient.

2-2. ASSEMBLE A PATIENT HISTORY

a. **Past Disease.** Ask the patient if he has had any diseases in the past. Be sure to note any of the following in the patient's past.

(1) Ulcers.

(2) Colitis--often indicated by intolerance for dairy products.

(3) Intestinal obstruction--accompanied by constipation or ribbon-like stools.

(4) Hiatal hernia--upper portion of the stomach protrudes through the opening in the diaphragm.

(5) Food or drug sensitivity.

b. **History of Current Illness.** Record such information including symptoms of the following.

(1) Anorexia. Include eating habits as well as previous and current weight.

(2) Nausea. Ask whether nausea is related to certain foods and medications.

(3) Vomiting. Include frequency and intensity of vomiting and whether or not there is blood in the vomitus.

(4) Diarrhea. Record frequency and types of stools such as whether the stools are loose, black, or bloody.

(5) Constipation. Ask the patient about the frequency of bowel movements and what medications were taken.

(6) Pain or cramps. Record the frequency and times that pain or cramps occurred.

c. **Surgeries.** Record information concerning operations. Include complications and dates of operations involving the appendix, gallbladder, intestines, stomach, female reproductive system, and genitourinary system.

d. **Weight.** Weight is an extremely important health issue. Record information regarding the following:

(1) Sudden increase or decrease in weight and accompanying reasons.

(2) Obesity and accompanying complications.

(3) Diets including types, dates, and times.

e. **Trauma.** Trauma and associated complications are also important and should be noted. Use of drugs or alcohol (use or abuse) should be determined in detail.

2-3. EXAMINE THE PATIENT

Provide privacy for the patient. Examine the mouth and pharynx first, then the abdomen, and, finally, the rectum. The examination should take place in a warm, well-lighted room. The patient should be in the supine position, the abdomen exposed, legs slightly flexed, and the arms to the side. Examination techniques must be performed in this sequence: inspection, palpation, and percussion.

a. **Mouth and Pharynx.** The lips should be pink and smooth. Look for cold sores, fever blisters, and chancre sores. The teeth should be white; gums should be pink and moist. Look for inflammation, swelling, and bleeding. The tongue should look velvety and pink. The palate should be firm and white. The pharynx should look pink and smooth in nonsmokers and yellowish-red with small nodules in smokers. Inspect mouth odor.

b. **Abdomen.**

(1) The quadrants. The abdomen is divided into four quadrants by imaginary lines crossing as shown in figure 2-1. The quadrants are named as follows: right upper quadrant (RUQ); left upper quadrant (LUQ); right lower quadrant (RLQ); and left lower quadrant (LLQ).

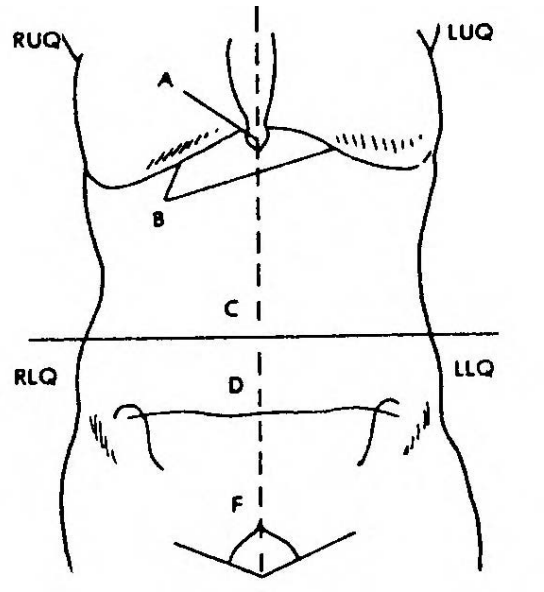


Figure 2-1. Quadrants of the abdomen.

(2) Major organs. These are the major organs along with the quadrant in which each organ is found. See figure 2-2 for the location of these organs.

(a) Liver--RUQ.

(b) Gallbladder--RUQ.

(c) Duodenum--RUQ.

(d) Spleen--LUQ.

(e) Descending and sigmoid colon--LLQ.

(f) Appendix--RLQ.

(g) Ileum--RLQ.

(h) Jejunum--periumbilical area.

(i) Bladder--suprapubic area.

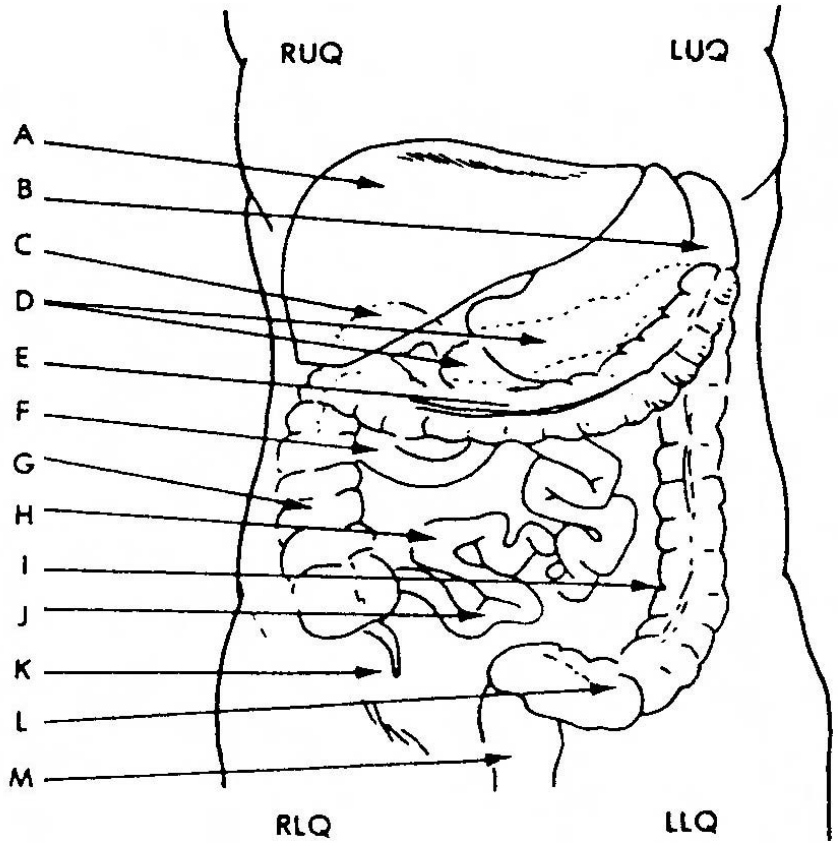


Figure 2-2. Digestive system organs.

(3) Observation. Observe these anatomical landmarks of the abdomen:

(a) Costal margins (hypochondrium area).

(b) Xyphoid process (hypochondrium area).

(c) Rectus abdominus muscle (all four quadrants).

(d) Umbilicus (periumbilical area).

(e) Iliac crest (pelvic bones).

(f) Pubic bone (surrounds bladder).

(g) Inguinal ligament (inner thigh).

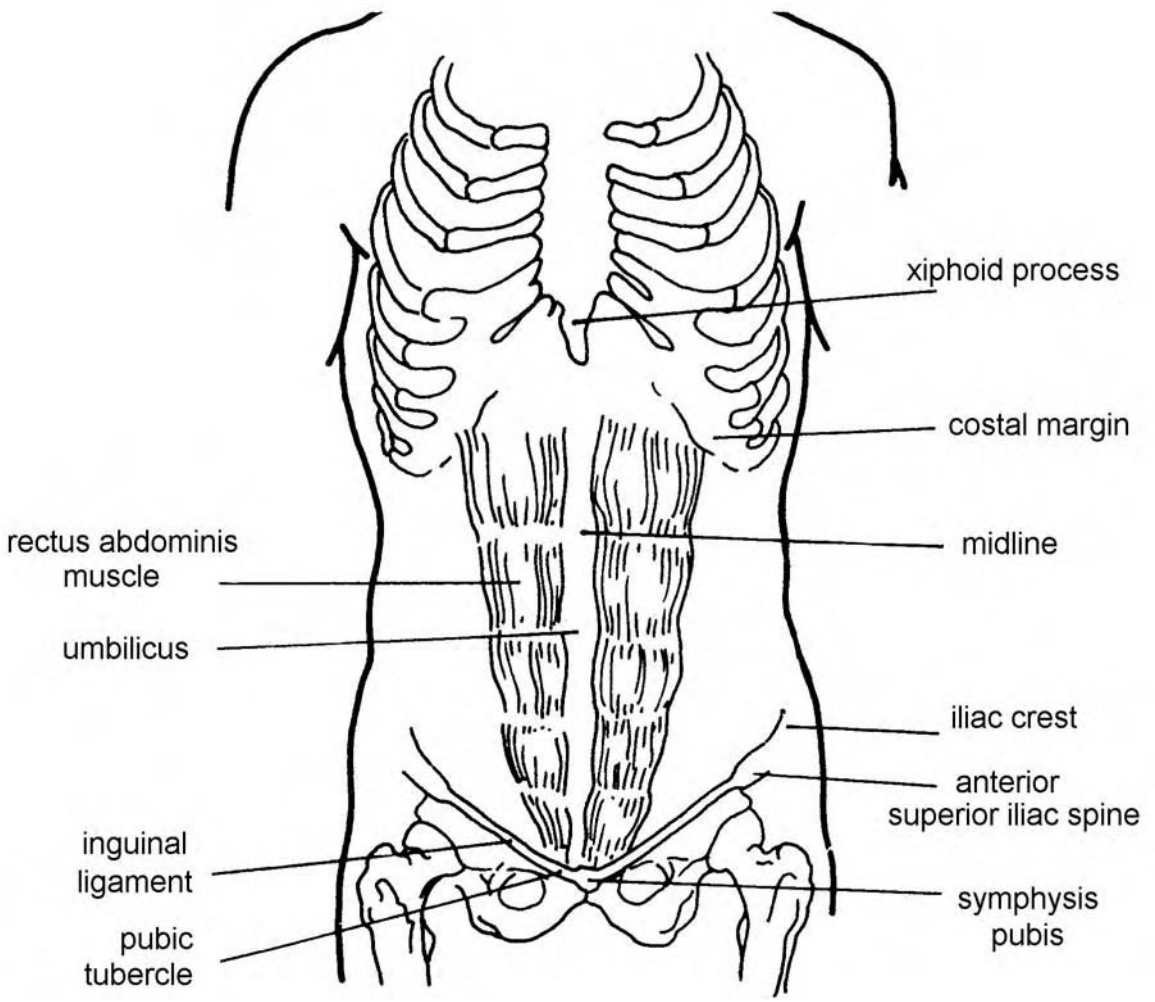


Figure 2-3. Abdomen landmarks.

(4) Inspection. Inspection or observation of the patient's abdomen is crucial. Look for the following:

(a) Distended abdominal veins (ascites)--indicated by an obstruction of the portal vein or vena cava.

(b) Spider nevi--indicated by dilated capillaries resembling a spider.

(c) Herniation--the protrusion of a structure through the peritoneum within the abdominal wall.

(d) Masses.

(e) Distention (ascites or gas)--indicated by tight, glistening prominent veins or umbilical protrusion.

(f) Discoloration (including jaundice) or blue or yellow color around the umbilicus--may indicated hemorrhaging.

(g) Visible peristaltic waves--indicative of intestinal obstructions.

(h) Abnormal hair distribution.

(i) Scars--may indicate past surgery. Note the exact location and description of scars.

(5) Auscultation. Perform auscultation before percussing or palpating the abdomen. The reason is that two forms of examination may alter the frequency of bowel sounds. When auscultating the stomach, listen in all four quadrants and the epigastrium. Note the frequency and character of the clicks and gurgles, the bowel sounds. Hypoactive sounds (softer than normal sounds) occur less than five times per minutes. Normal sounds occur five to 34 times per minute, and hyperactive sounds (louder than normal sounds) occur 34 or more times per minute. Hyperactive sounds are the sounds of gastritis or gastroenteritis. No sounds for five minutes may indicate peritonitis or paralytic ileus.

(6) Palpation. Palpate each quadrant with the suspicious area being palpated last. This type of examination is useful for general orientation to the abdomen and for identifying air in the stomach and the bowel. Superficial or light palpation may disclose rigidity or guarding (involuntary or voluntary) of the abdominal wall. Use extreme caution and do not palpate patients who are extremely aware of this type of examination. In other patients, apply firm pressure indenting the skin about one half inch to locate organs and determine their size. Note any tenderness found during palpation. Rebound (during withdrawal) is done last. Tenderness could suggest peritonitis. When using firm pressure to palpate, note any masses--the amount of tenderness, size, shape, consistency, pulsations, and motility.

(7) Percussion. Percussion is useful for general orientation to the abdomen. In all four quadrants, percuss the abdomen lightly. Do this to assess the general proportions and distribution of tympany and dullness. Generally, tympany predominates. The organs which should be percussed include the liver, the epigastric bubble, the spleen, and the bladder.

c. **Anus and Rectum.** Examine the anus and the rectum last. When you are conducting a physical assessment of the rectal area, you are concerned with inspection and palpation only. Inspect for hemorrhoids, rectal prolapse, and masses. Palpate after you have inspected visually. A rectal examination of the prostrate is concerned with discharge, shape and size, consistency, and tenderness. Laboratory and other studies indicate whether ova and parasites or occult blood exist in the stools.

2-4. LABORATORY AND OTHER STUDIES

a. **Stool.** Fecal matter should be examined for consistency. It should be soft and brown. Look for blood or pus in the fecal matter. Note if the color is very light tan or gray or tarry black. Very light tan or gray feces could indicate obstructive jaundice. A stool which is tarry and black could indicate upper intestinal tract bleeding. Fecal matter can be tested for blood by use of a chemical guaiac procedure.

b. **Gastric Analysis.** Perform a gastric analysis by withdrawing the contents of the stomach through a nasogastric (NG) tube. Laboratory analysis determines secretions, acidity, undigested food, occult blood, bacteria, tuberculosis (TB) or cancer cells (CA) analysis.

2-5. CONCLUSION

There is no substitute for a thorough and properly performed examination of any system. You are less likely to miss important signs by following the suggested techniques and sequencing discussed.

Continue with Exercises

EXERCISES, LESSON 2

INSTRUCTIONS. Answer the following exercises by writing the answer in the space provided.

After you have completed all of these exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. List four past diseases/ problems you should ask about when you are taking the patient's history.

   a. _____.

   b. _____.

   c. _____.

   d. _____.

2. A soldier is suffering from anorexia. When taking information on his current illness, be sure to ask him about his eating habits and his previous and current _____.

3. List the names of the four quadrants of the abdomen.

   a. _____.

   b. _____.

   c. _____.

   d. _____.

4. List five of the 13 organs in the abdomen.

   a. _____.

   b. _____.

   c. _____.

   d. _____.

   e. _____.

5. List four of the seven landmarks of the abdomen.

   a. _____.

   b. _____.

   c. _____.

   d. _____.

6. To perform a gastric analysis of the contents of the stomach, withdraw the stomach contents through _____.

7. The two examination methods used when performing a physical examination of the anus and rectum are _____and _____.

8. When you are auscultating the stomach, you should note the frequency and character of the _____ sounds.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 2

1. Ulcers.
   Colitis.
   Intestinal obstruction.
   Hiatal hernia. (para 2-2a)

2. Weight. (para 2-2b(1))

3. Right upper quadrant (RUQ).
   Left upper quadrant (LUQ).
   Right lower quadrant (RLQ).
   Left lower quadrant (LLQ). (para 2-3b)

4. You are correct if you listed any five of the organs shown in figure 2-2. (para 2-3b(2))

5. You are correct if you listed any four of the following:

   Costal margins.
   Xyphoid process.
   ectus abdominus muscle.
   Umbilicus.
   Iliac crest.
   Pubic bone.
   Inguinal ligament. (para 2-3b(3))

6. A nasogastric tube. (para 2-4d)

7. Inspection and palpation. (para 2-3c)

8. Bowel. (para 2-3b(5))

End of Lesson 2

LESSON ASSIGNMENT

LESSON 3	Diseases and Disorders of the Gastrointestinal System.
LESSON ASSIGNMENT	Paragraphs 3-1 through 3-23.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

3-1. Identify characteristics, signs/symptoms, and treatment of diseases and disorders of the mouth.

3-2. Identify characteristics, signs/symptoms, and treatment of diseases and disorders of the esophagus.

3-3. Identify characteristics, signs/symptoms, and treatment of cirrhosis of the liver.

3-4. Identify characteristics, signs/symptoms, and treatment of diseases and disorders of the stomach.

3-5. Identify characteristics, signs/symptoms, and treatment of hernias.

3-6. Identify characteristics, signs/symptoms, and treatment of diseases and disorders of the gallbladder.

3-7. Identify characteristics, signs/symptoms, and treatment of diseases and disorders of the small intestine.

3-8. Identify characteristics, signs/symptoms, and treatment of diseases and disorders of the large intestine.

SUGGESTION After completing the assignment, complete the exercises of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 3

DISEASES AND DISORDERS OF THE GASTROINTESTINAL SYSTEM

Section I. DISEASES/DISORDERS OF THE UPPER GASTROINTESTINAL SYSTEM

3-1. INTRODUCTION

a. **General Information.** The general function of the gastrointestinal system is to break down and absorb foods and eliminate some of the waste products produced in the process of metabolism. Foods are changed into simple forms that can be absorbed into the bloodstream or lymphatics and, eventually, used by the cells of the body. Much of the water we need comes from the foods we eat; water is necessary for cellular activity. The gastrointestinal system prepares the food for consumption by the cells through five basic activities: ingestion (eating); peristalsis (moving food along the digestive tract); digestion (breaking down food chemically and mechanically); absorption (moving digested food from the digestive tract into the cardiovascular and lymphatic systems for absorption by the cells); and defecation (elimination of indigestible substances from the body). The gastrointestinal tract is affected, however, by a variety of factors, and sometimes there are problems in the functioning of the various organs. At some time almost everyone has had a gastrointestinal disorder--an attack of indigestion; a sudden loss of appetite; constipation; or diarrhea. Some disturbances correct themselves; others are more serious.

b. **Upper Gastrointestinal Diseases and Disorders.** The organs of the upper gastrointestinal tract are mainly concerned with the transportation of enzymes to break down food substances. Organs in this system include the esophagus, stomach, and the small intestine. Diseases and disorders of the esophagus and abdomen as well as hernias are functional problems occurring in this part of the gastrointestinal tract.

3-2. COMMON DISEASES AND DISORDERS OF THE MOUTH

a. **Aphthous Ulcer (Canker Sore, Ulcerative Stomatitis).**

(1) Definition. Aphthous ulcer is a tiny ulcer which occurs on the muscosa of the mouth, either singly or in batches.

(2) Etiology. The specific cause of these mouth ulcers is unknown. There are some predisposing contributing factors:

(a) Deficiency in iron, B_{12}, and folic acid.

(b) Stress.

(c) Irritation by nuts, chocolate, and citrus fruits.

(d) Inflammatory bowel disease, infectious mononucleosis, prolonged fever, etc.

(3) Signs and symptoms. The first stage begins as a shallow erosion with a slightly raised, yellowish border. The erosion is bordered by a narrow, crimson zone. In five to seven days, the ulcer is covered with a yellowish opaque material made up of coagulated tissue fluids, oral bacteria, and white blood cells. For three to four days, the ulcer is extremely painful; then the ulcer heals spontaneously, and the pain is gone. If several, very painful ulcers occur at the same time, the patient may experience a vague feeling of ill health, fever, and lymph node disease.

(4) Treatment. A topical anesthetic such as two percent lidocaine can be used as an oral rinse. Hydrocortisone, an antibiotic ointment, can be applied. Usually, antibiotics that affect the entire system are not administered.

b. **Cancer of the Mouth.**

(1) Etiology. Cancer of the mouth has the advantage of being visible to the patient, his doctor, or his dentist early in the disease. Among the causes may be warm pipe stems and prolonged exposure to wind and sun. Cancerous lesions may also develop on the lips and the tongue.

(2) Signs and symptoms. An early sign of cancer may be pearly, crinkled areas on mucous membranes. An ulcer on the lips or gums which fails to heal is another sign. Swelling and loss of feeling in that part of the body is another indication of cancer of the mouth.

(3) Treatment. Possible treatments include surgical removal of the cancer, surgical removal and radiation, or radiation by itself. Mouth lesions or lymph nodes can be surgically removed. If the cancer is inoperable, radiotherapy can be used to make the cancer smaller. Systemic chemotherapy can be used to slow the tumor growth.

3-3. DISEASES AND DISORDERS OF THE ESOPHAGUS

a. **Pyrosis (Heartburn).**

(1) Definition. Pyrosis, commonly called heartburn, is an eating disorder in which there is a burning sensation in the esophagus.

(2) Etiology. Pyrosis is caused by stomach contents rushing back into the esophagus. This may happen after too large a meal or after emotional stress. Both can cause the sphincter muscle which is between the esophagus and the stomach to relax letting the acid-peptic contents of the stomach and sometimes alkaline juices move back into the esophagus. Then, the individual feels a burning sensation. Heartburn will often occur when a person is lying down. The pain begins beneath the breast bone and sometimes spreads up the chest, into the neck and throat, and even into the face.

(3) Signs/symptoms. Signs and symptoms include the following:

(a) Disagreeable burning pain below the substernum (breast bone).

(b) Difficulty in swallowing if the person has experienced heartburn over a long period.

(4) Treatment. Treatment includes the following:

(a) Elevate the head and upper body when lying down.

(b) Maintain an erect position after eating.

(c) If overweight, lose excess pounds.

(d) Avoid tight clothing such as tight belts, girdles.

(e) Bland diet. Avoid the following foods:

1 All fried foods.

2 Canned soups.

3 Raw vegetables and gas-forming vegetables.

4 Pork.

5 Meat gravies.

6 Smoked meats.

7 Raw fruits, except bananas and orange juice.

8 Coarse breads and cereals.

9 Coffee, tea, alcoholic, and carbonated beverages.

10 Pastries, candy, nuts, raisins

11 Spicy foods and highly seasoned foods.

b. **Reflux Esophagitis.**

(1) Definition. Reflux esophagitis is inflammation of the esophagus which spreads through the lining of that organ. Inflammation is caused by stomach or duodenal contents flowing back up into the esophagus. The sphincter muscle has relaxed and allowed this backward flow. This condition is often accompanied by hiatal hernia.

(2) Etiology. The cause of the inflammation, as mentioned in the previous paragraph, is that the sphincter muscle has relaxed and allowed stomach and duodenal contents to flow back into the esophagus. These contents contain acids and pepsins not normally found in the esophagus; these substances sitting in the stomach cause the inflammation. Additionally, the esophagus is temporarily unable to generate secondary peristaltic waves which would normally prevent stomach and duodenal contents from being in contact with the esophageal lining for any length of time.

(3) Signs/symptoms. The most common symptom is heartburn which is frequently severe and occurs about 30 to 60 minutes after eating. Heartburn begins, becomes worse when the person lies down but better when the person sits up. Pain at the lower sternal or xiphoid level frequently radiates into the interscapular area, neck, jaw, or down the arm. Pain down the arm is sometimes confused as cardiac pain. Aspiration, breathing into the trachea of some of the regurgitated stomach contents, may cause coughing, bleeding, or abnormal narrowing of the trachea. Other symptoms include water brash (combination of regurgitation and increased salivation), dysphagia (difficulty in swallowing), odynophagia (painful swallowing), hematemesis (vomiting of blood) occur if reflux esophagitis becomes very severe. Eventually, a person may develop iron deficiency anemia if there is chronic bleeding which is not evident.

(4) Preventive therapy. Have the patient with a tendency to have reflux esophagitis follow these measures:

(a) Lose weight, if the patient is heavy. Obesity is associated with this condition, and obesity sometimes helps cause reflux esophagitis.

(b) Avoid tight belts, girdles, or any tight clothing. Reflux esophagitis is aggravated by abdominal pressure.

(c) Avoid lying down immediately after meals.

(d) Sleep with the head of the bed elevated 20 to 25 centimeters. Wooden blocks can be used to elevate the head of the bed.

(e) Alginte-antacid (Gaviscon) can be chewed one hour after each meal and at bedtime in the dose of one or two tablets chewed thoroughly to relieve the symptoms.

(f) Bland meals are recommended: milk, cream, prepared cereals, gelatin, soup, rice, butter, crackers, eggs, lean meat, fish, and cottage cheese.

(g) Eat slowly.

(h) Do not eat anything three or four hours before going to bed.

(i) Avoid esophageal irritants such as alcohol, tobacco, coffee, chocolate, carbonated beverages, mints, chewing gum, and sucking on hard candies.

c. **Esophageal Varices.**

(1) Definition. Esophageal varices means enlarged and twisted veins in the esophagus, usually in the lower part of the esophagus. This esophageal vein condition may extend even into the stomach and into the upper esophagus.

(2) Etiology. There are several causes of esophageal varices, but the most common cause is portal hypertension which is abnormally increased blood pressure in the portal venous system. When blood cannot flow through the portal vein freely, the blood tries another route--bypassing the portal vein and liver and reaching the venae cavae through various other veins. The blood is forced through the coronary veins of the stomach, the network of veins surrounding the cardia, and the lower esophageal veins. This causes unusual pressure on the esophageal veins, and the result is that the veins stretch and twist becoming esophageal varices. Another cause of esophageal varices is abnormal blood circulation in the splenic vein the superior vena cava.

(3) Signs/symptoms. There are usually no symptoms until the mucosa over the veins becomes ulcerated. When that happens, massive hemorrhaging takes place.

(4) Rupture. Several factors contribute to rupture of esophageal veins. Muscular strain from coughing and vomiting is one factor. Another is esophagitis (inflammation of the esophagus). Poorly chewed foods can irritate esophagal veins. An individual with a history of alcoholism is very liable to have esophageal varices that rupture.

(a) Signs/symptoms. Rupture of the enlarged, twisted veins is painless. Abruptly, hematemesis (vomiting of blood) occurs. Melena, passage of dark, tarry stools due to blood which has originated in the intestinal tract, may occur. Loss of blood may cause shock with these signs and symptoms: pale, clammy skin; progressive, consistent fall in blood pressure; rapid, thready, or quivery pulse; rapid and shallow respirations; and blueness of fingernail beds or lips due to lack of oxygen.

(b) Treatment. Follow this procedure.

1 Control hemorrhage. Use a Sengstaken-Blakemore tube to stop the esophageal veins from hemorrhaging. This piece of equipment has three tubes. One tube leads to a balloon which inflates in the stomach and holds the device in place and hold the vessels of the cardia in place. A second tube leads to a long, narrow balloon in the esophagus; when inflated, this balloon exerts pressure against the hemorrhaging veins of the esophagus. A third tube is attached to a suction device and aspirates contents of the stomach.

2 Perform ice water lavage. Wash out the esophagus with ice water after you have controlled the hemorrhaging veins.

3 Sedate the patient and give the esophagus complete rest.

4 Administer feedings intravenously.

3-4. DISEASES AND DISORDERS OF THE STOMACH

a. **Acute Simple Gastritis.**

(1) Definition. Acute simple gastritis is an acute inflammation and erosion of the stomach mucosa (lining of the stomach). This is the most common disturbance of the stomach and occurs in all age groups. In this disorder, a number of changes take place in the stomach lining. There is vascular congestion, excessive accumulation of blood in the blood vessels. Edema, an abnormal collection of fluid in the intercellular tissue spaces, occurs, and degenerative changes of tissue to a less functionally active form also occur in the stomach lining. This stomach disorder often begins suddenly and violently but does not last very long.

(2) Etiology. There are a variety of causes including the following:

(a) Chemical irritants; for example alcohol, salicylates.

(b) Bacterial infections or toxins; for example, staphylococcal food poisoning, scarlet fever, pneumonia.

(c) Viral infections; "viral gastroenteritis," measles, hepatitis, influenza.

(d) Allergy; for example, to shellfish.

(e) Drugs.

(f) Ingestion of poisons.

(g) Dietary indiscretion; excess of tea or coffee, excess of heavily spiced food.

(3) Signs/symptoms. Anorexia, loss of appetite, is always present. Other signs and symptoms include:

(a) Epigastric fullness (full stomach) and pressure in that area.

(b) Nausea and vomiting.

(c) Headache and dizziness.

(d) Malaise, a general feeling of discomfort or sickness.

(e) Examination indicates mild stomach tenderness.

(f) Hemorrhage present if cause is chemical irritants.

(g) Diarrhea, colic, malaise, fever, chills, headache, and muscle cramps if toxins or infections are the cause.

(4) Treatment. Treatment depends on the cause of the illness and the symptoms of the patient. Generally, remove the offending agent, if that is appropriate, and treat the specific infections.

(a) If the patient has become dehydrated, correct the water and electrolyte disturbances. Do not give the patient anything by mouth until he has stopped vomiting. Then, begin by giving him clear liquid and, later, progress to a diet of soft foods as the patient can tolerate them. Intravenous fluids may be necessary to correct dehydration and electrolyte imbalances if vomiting and/or diarrhea have been severe. Drugs to control nausea, vomiting, and diarrhea may be prescribed. Tigan® (trimethobenzamide) is a medicine that can be given to combat nausea and vomiting. The dosage depends on the severity of the problem and the response of the patient to the medication.

(b) If the patient is in severe pain, give an analgesic.

CAUTION: Do NOT use aspirin because aspirin can be very irritating to the stomach lining.

(c) For the patient who has ingested poisons, toxic chemicals, or corrosive substances, emergency treatment for the specific substance is necessary. For example, ingestion of a chemical that is acid in nature is treated with an alkali to neutralize the acid. Treatment which follows is based on the damage done to the patient's body.

b. **Peptic Ulcer.** This stomach problem is common among adults. It has been suggested that peptic ulcer is more common among executives, salespeople, and others who do competitive work in an industrial society, this gastric problem being a reaction to the stresses and strains of life in a complex society. Actually, people in all walks of life throughout the world in all types of society develop peptic ulcers. This problem is more common among men, particularly those in their thirties and forties.

(1) Definition. A peptic ulcer is an acute or chronic ulceration (an open lesion) in a part of the digestive tract that comes in contact with gastric juice, either in the lining of the stomach or the duodenum. The term peptic ulcer refers to an ulcer in any part of the gastrointestinal tract; therefore, peptic ulcers are further classified according to location--gastric peptic ulcer or duodenal peptic ulcer.

(2) Etiology. The stomach must secrete acid for a peptic ulcer to develop. Everybody's stomach secretes acid; however, some people develop ulcers while other people do not. Ulcers develop when the elements which protect the stomach's mucosal lining are unable to resist the corrosive effects of the acid or pepsin secreted into the stomach. Some studies show that stress upsets the balance between the stomach's secretions and mucosal lining resistance with the result that ulcers develop. Some drugs such as aspirin, some nonsteroidal anti-inflammatory drugs, and some corticosteroids cause ulcers. Discontinue the drug, and these ulcers tend to heal without recurring unless the person takes the offending drug again. Extreme gastric hyperacidity which produces atypical peptic ulcers is part of the disease Zollinger-Ellison syndrome.

(3) Duodenal peptic ulcer. The duodenal ulcer is caused by the action of gastric juice and is found on the mucosa of the duodenum. The patient may have no symptoms but feel vaguely uncomfortable, have symptoms which are not normal for ulcers, or have some typical symptoms. Typical symptoms include general stomach tenderness, stomach pain 40 to 50 minutes after a meal, and/or stomach pain which begins after the person has gone to bed. Stomach pain for this disorder has been described as gnawing, burning, aching, or hunger pangs. The person eats, takes an antacid, or vomits and feels better. Examination of the patient reveals stomach tenderness and guarding. The problem may be chronic or periodic and is ten times more frequent in men than women.

(4) Gastric peptic ulcer. A gastric ulcer is an open lesion located close to the pyloric antrum (the lesser curve of the stomach). A gastric ulcer is caused by a break in the peptic epithelium (the lining of the digestive organs). Unlike the duodenal ulcer, the gastric ulcer is not associated with too much acid in the stomach or with the emptying time of the stomach. What happens in this disorder is that regurgitation (a backward flowing) of digestive contents into the stomach contains bile salts. These salts lead to the destruction of the surface mucus of the stomach. Particular drugs such as aspirin and cortisone cause the stomach lining to be less resistant to acid. Also, alcohol and caffeine increase the secretion of acids. Eating sometimes actually causes rather than relieves pain. Many gastric ulcers have no symptoms, but when there is pain, it is located in the upper portion of the stomach, often to the left of the midline. Also, medical treatment does not usually stop the symptoms. Vomiting is more common with gastric ulcers than with uncomplicated duodenal ulcers. The incidence of gastric ulcers is about the same for women as for men. Unlike duodenal ulcers, gastric ulcers can become malignant.

(5) Complications of peptic ulcers. The most important complications of peptic ulcers are hemorrhage, perforation, penetration, and obstruction. Eventually, these complications generally require surgical treatment.

(a) Hemorrhage. Hemorrhage is the most frequent complication of a peptic ulcer. Hemorrhaging (heavy bleeding) occurs when the walls of a blood vessel are worn away by the ulcer. If the blood vessel is large, massive bleeding results. If the blood vessel is small or not fully opened, there may be small seepage of blood which is not noticeable. Seepage of blood may not be noticeable until enough blood has been lost for the patient to exhibit signs and symptoms of hemorrhage: chills, thirst, cold, moist skin, and a desire to defecate. The patient may pass black, tarry stools (melena) or vomit blood (hematemesis). The blood which is vomited is either bright red or dark with the consistency of coffee grounds. Bleeding high in the gastrointestinal tract produces black, tarry stools. Bleeding near the anus (for example, hemorrhoids) is bright red mixed with the stool. A person suffering from a massive hemorrhage will exhibit these signs and symptoms with a rapid decrease in body blood volume go into profound shock. His pulse will be rapid and weak, and his blood pressure may drop to 80 mm. or less. Pale skin, thirst, faintness, sweating, and eventually collapse also characterize massive hemorrhage. This patient needs blood transfusions, intravenous feedings, and rest until the bleeding has stopped.

(b) Perforation. Erosion of an ulcer through the wall of an organ (for example, the stomach) is called perforation. The patient experiences sudden, severe pain which is located in the middle portion of the stomach. If these symptoms are severe enough, the patient may faint but regain consciousness quickly when placed in the recumbent position (lying down). The pain may radiate to the shoulders and the right lower quadrant of the abdomen then lessen for a few hours. When palpated, the abdomen is found to be tender, abdominal muscles are rigid, and bowel sounds are quieter than normal. The patient usually lies as still as possible in an effort to avoid any movement which will increase the pain. Sometimes even breathing makes the pain worse. If surgery is delayed more than 24 hours, begin gastric suction, antibiotics, and intravenous fluids.

(c) Penetration. This complication is the extension of the ulcer crater beyond the duodenal wall into the adjacent organs. The penetration actually extends into the deep tissues of an organ; for example, a duodenal ulcer may penetrate into the pancreas or liver. Symptoms include intense pain which is persistent and which may occur in the back. Location of the pain may change with the way the patient sits or lies down. The pain is more intense at night, and the patient gets no relief from eating food or taking antacids. A patient with a long history of duodenal ulcer who suddenly experiences these symptoms will usually have an ulcer complicated by penetration. When treatment by antacids is unsuccessful in producing healing, surgery is necessary.

(d) Obstruction. Obstruction as an ulcer complication refers to the blocking or clogging of the gastrointestinal tract. There are two types of pyloric obstruction due to ulcer: spastic obstruction and scar obstruction. Spastic obstruction is characterized by edema (swelling) underlying spasm of the pylorus (the opening between the stomach and duodenum through which stomach contents pass in the digestive process) and the duodenum (the first part of the small intestine). An active ulcer causes spastic obstruction. With proper treatment, patients with spastic obstruction can recover completely, or they may have repeated attacks fully recovering from each attack. Scar pyloric obstruction is caused by the healing process of an ulcer. Scar tissue has formed at the opening of the pylorus and duodenum causing that opening to become narrower. This condition can only be corrected surgically. Symptoms include vomiting and bloating or fullness after eating. Because of these feelings, the patient may have limited his own food intake and lose weight as a result.

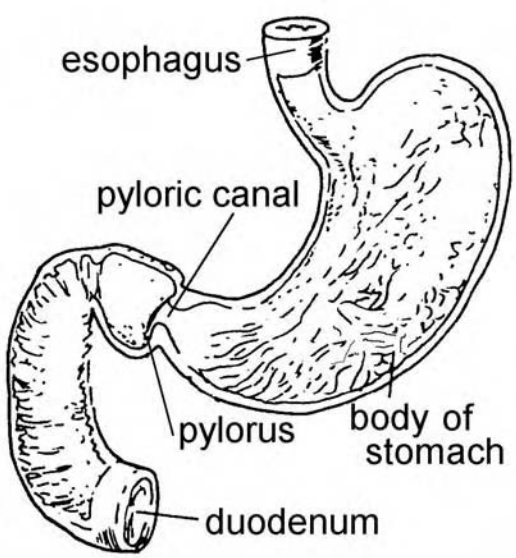


Figure 3-1. Pylorus (the opening between the stomach and the duodenum).

(6) Treatment. The goal of medical treatment of peptic ulcer is to provide the best conditions for the ulcer to heal. To that end, treatment tries to increase the pH level and neutralize gastric hydrochloric acid as well as reduce the amount of hydrochloric acid secreted. Conventional ulcer management is as follows:

(a) For acute symptoms the patient should take a two to three week's rest from work, at home in bed if possible. If the patient must work, he should arrange for rest periods while at work and be sure to get enough sleep at night.

(b) Relieve anxiety.

(c) No alcohol.

(d) Stop smoking, if possible without too much stress.

(e) Avoid drugs which may aggravate the condition and even cause perforation and hemorrhage. Stop taking these drugs if he is taking them now:

1 Rauwolfia.

2 Phenylbutazone.

3 Indomethacin.

4 Large doses of salicylates.

(f) Dietary management. The bland, smooth diets prescribed for ulcer patients in the past are not considered today to promote ulcer healing. Instead, these guidelines should be followed:

1 Eat nutritious, regular meals.

2 Restrict or avoid, drinking coffee, tea, and cola.

3 Each patient should avoid food he finds intensify his ulcer symptoms. These foods will probably be different for each patient.

(g) Take antacids frequently. In the acute ulcer stage, take in the dosage 15 to 30 cc every hour during the day and, if necessary, antacids at night. Later, change to a full antacid dosage as prescribed one to three hours after each meal and at bedtime. This dosage should stop pain. If it does not, the stomach may be emptying too rapidly, or more acid is being secreted than the antacid can neutralize.

NOTE: Milk of magnesia may cause diarrhea; therefore, do not use it but use Amphojel®.

(h) Tagamet® (cimetidine) may be taken one hour before meals and at bedtime. This medication blocks gastric acid stimulated by food and other substances. It also acts to cut down on gastric acid secreted at night and other times when there is no stimulus.

(i) Nasogastric intubation may be necessary if the patient is secreting too much gastric acid, there is bleeding, or vomiting. Intubation allows the ulcer to heal.

(j) Any gastrointestinal bleeding or persistent acute symptoms indicate that the patient should be hospitalized.

Section II. HERNIAS

3-5. INTRODUCTION

A hernia is a condition in which a structure, organ, or part of an organ protrudes (bulges) out through the wall of its body cavity. As the organ or structure bulges out of its body cavity, it becomes enclosed in a pouch called a hernial sac. The hernial sac is made up of tissues that line the body cavity. Nonmedical people frequently use the word rupture to refer to a hernia. Hernias are the most common type of muscle disorder and occur in areas in which there is a structural weakness in the wall of the body cavity. For example, the lower part of the abdominal wall has structural weak points at the places where large blood vessels and nerves leave the abdomen and enter the leg. In men, the place where the spermatic cord passes up from the testes and enters the abdominal cavity is another structural weak point. The first sign of a hernia may be a lump or swelling appearing on the abdomen underneath the skin. The swelling may be large or small, depending on how much of the structure or organ has bulged out of its cavity. Whether a person is born with a weakness in a body cavity wall or later develops such a weakness, an individual who strains to lift heavy objects or bears down strongly increases the risk of developing a hernia.

3-6. TYPES OF HERNIA

Types of hernia discussed in this lesson are the inguinal hernia, abdominal hernia, and hiatus hernia. Abdominal hernias are further subdivided to include femoral hernia, umbilical hernial, and ventral (incisional) hernia. The hiatal hernia is considered an upper gastrointestinal problem. The inguinal and abdominal hernias are considered lower gastrointestinal disorders. Three types of hernias have been named according to the weak point on the abdominal wall where they occur. The inguinal hernia occurs at the inguinal ring, the point on the abdominal wall where the inguinal canal begins. The femoral hernia occurs at the femoral ring which is the abdominal opening of the femoral canal. The umbilical hernia occurs at the navel. The incisional hernia gets its name not from the location of a body cavity weakness but from the fact that the hernia occurs through the scar of a surgical incision.

3-7. HIATUS HERNIA (UPPER GI SYSTEM)

a. **Definition.** A hiatus or hiatal hernia results from a gap in the diaphragm that permits a part of the stomach, intestine, or other organ to move up into the chest. The most common form of this hernia is a sliding hiatus hernia; the lowermost part of the esophagus has moved above the diaphragm and brought a part of the stomach with it. In another type of hiatus hernia, the paraesophageal hernia, the esophagus stays in the normal place but part of the stomach has moved through the hiatus to rest beside the esophagus.

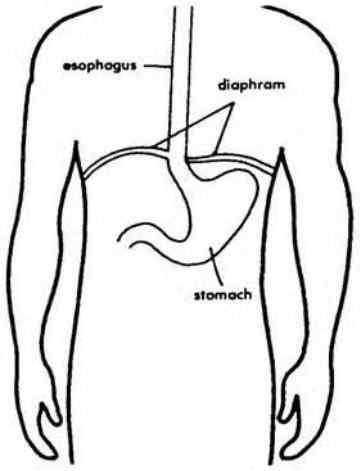


Figure 3-2. Normal position of stomach, diaphragm, and esophagus.

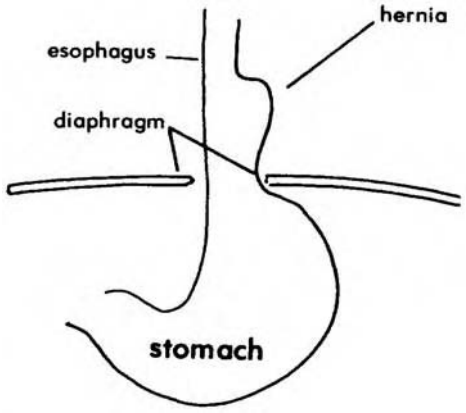


Figure 3-3. Sliding hiatus hernia.

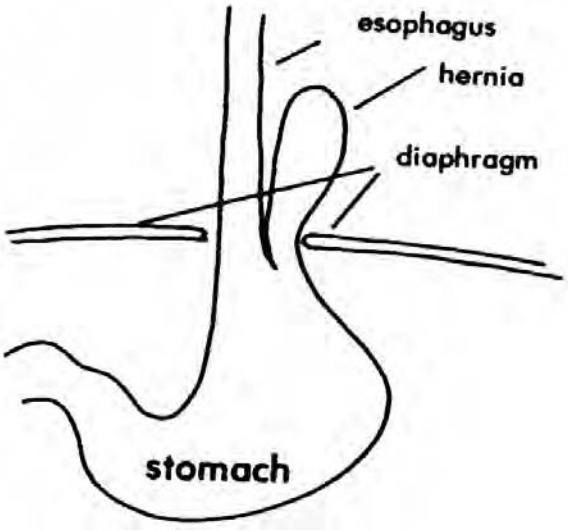


Figure 3-4. Paraesophageal hernia.

b. **Etiology.** This type of hernia can be caused by a congenital weakness in the diaphragm or a blow to the diaphragm with a blunt object. Persons who are obese or women who have had multiple pregnancies have a high incidence of hiatal hernia.

c. **Signs/Symptoms.** There is no visible bulge with this hernia. The first symptom is usually heartburn, a condition that is worse after the patient has just eaten a heavy meal or when he lies down or bends over. Eventually, the patient may experience more severe pain, pain which is aggravated by highly seasoned foods or alcoholic beverages. In a small number of cases, contents of the stomach may flow backward causing distress. If the patient suffers very severe pain which lasts for several hours, consider that the hernia may have become strangulated. This is a medical emergency, and surgery is indicated.

d. **Treatment.** Most hiatal hernias can be treated without surgery. The patient should:

(1) Take antacids. Either cimetidine or Tagamet® in the dose of 300 mg can be taken 4 times a day; that is, before each meal and at bedtime.

(2) Sleep with his head elevated (blocks can be placed under the head of the bed).

(3) Avoid bending, stooping, and lifting heavy objects.

(4) Wear loose rather than tight fitting clothing across the abdomen.

(5) Strive to maintain a relaxed attitude in his daily routine.

(6) Avoid foods that contain substances which strongly initiate acid secretion; for example, alcohol, coffee, etc.

(7) Eat small meals.

(8) Avoid certain drugs, specific foods, and smoking as recommended by a physician.

(9) If the hiatal hernia does not respond to this treatment, surgery might be necessary. Surgical correction involves putting the protruding stomach back into the abdominal cavity and repairing the diaphragmal defect that allowed the stomach to push through.

3-8. ABDOMINAL HERNIA (LOWER GI SYSTEM)

a. **Definition.** A hernia in which an abdominal structure or organ bulges through the abdominal wall is termed an abdominal hernia. Three types of this hernia are the femoral hernia, umbilical hernia, and ventral or incisional hernia.

(1) Femoral hernia. More common in women than in men, this hernia occurs in the upper thigh, just below the groin. A loop of bowel breaks through the femoral ring and can be held fast (an incarcerated hernia) or the bowel loop can swell causing its blood supply to be cut off (a strangulated hernia). The strangulated hernia requires immediate surgery.

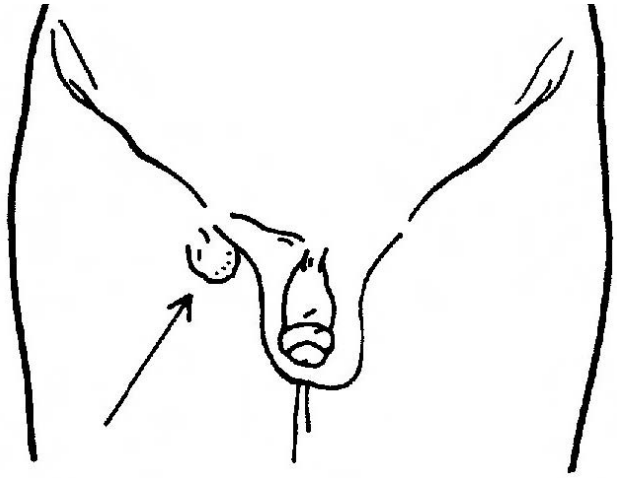


Figure 3-5. Femoral hernia.

(2) Umbilical hernia. An umbilical hernia results from the failure of the umbilical orifice (the navel) to close. A part of the intestine pokes through the umbilical ring (the navel). Such hernias are most common in obese women and in children. This type of hernia occurs in adults but is more common in children. The umbilical hernia also is prevalent in patients with cirrhosis of the liver and ascites (accumulation of free serous fluid in the abdominal cavity in amounts which can be detected).

(3) Incisional (ventral) hernia. This hernia also occurs because of a weakness in the abdominal wall, but the weakness is in the scar from a recent incision. The surgical incision may have been infected leaving the area along the incision weakened and an ideal place for an organ to poke out.

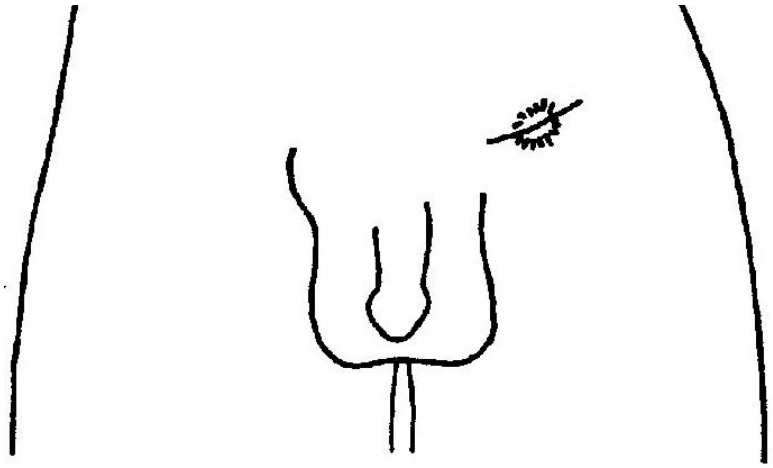


Figure 3-6. Incisional (ventral) hernia.

b. **Etiology.** As with other hernias, there is a weakness in the wall which encloses an organ. Perhaps the person was born with the weakness or exertion such as lifting heavy objects or straining over long periods of time caused an opening which allowed the organ to bulge out.

c. **Complications.** The abdominal hernia as well as the inguinal hernia can become incarcerated or strangulated. Remember that an incarcerated hernia is one in which the portion of the organ which has bulged through a weakness in a body cavity wall cannot get back into the body cavity. Substances which normally flow through the intestine cannot do so. A strangulated hernia is an incarcerated hernia with one more problem; not only can the intestinal flow not pass through the intestine but the blood supply in intestinal tissues is cut off. This condition can lead to intestinal tissue death and death of the patient if the trapped intestine is not surgically remove and intestinal flow started again by connecting the remaining intestine. It is impossible to distinguish between an incarcerated hernia and a strangulated hernia; therefore, treat a hernia that could be either of these as a medical emergency. Signs and symptoms of these hernias include constant pain, elevated white blood count, tachycardia (abnormally fast heart beat), and tenderness in spot.

d. **Symptoms.** The hernia may visible as an area which bulges out. Also, each time the patient lifts a heavy object or strains in any way, he may feel pain.

e. **Treatment.** There are two possible treatments for abdominal hernia: surgery and mechanical reduction (trusses). Surgery is usually the treatment of choice. Use of a truss was once common practice for those who wanted to avoid hernial surgery. A truss was a belt and a pressure pad used to keep a hernia in place or to prevent it from becoming larger. The use of trusses is not common today because a truss does not cure the hernia. The prolonged pressure can lead to pressure sores and the breakdown of underlying tissues. These conditions make surgical repair of the hernia more difficult later. Additionally, even though the patient wears a truss, his hernia can get larger as well as become incarcerated or strangulated.

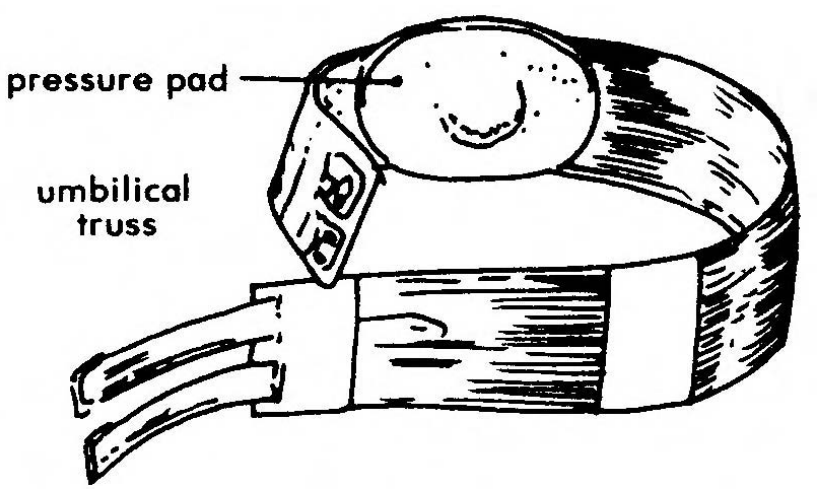


Figure 3-7. Truss for a hernia.

3-9. INGUINAL HERNIA (LOWER GI SYSTEM)

a. **Definition.** An inguinal hernia is a very common type of hernia in which a loop of intestine slips through the inguinal canal and appears in the groin or scrotum of a male or in the round ligament of a female. This type is more common in men than in women and accounts for about 75 percent of all hernias.

b. **Etiology.** Inguinal hernias are considered to be congenital or acquired. A congenital cause refers to the fact that the weakness in the abdominal wall was present at birth. The actual bulging out of an organ may not happen for years after birth. During prenatal development, the muscle wall above the spermatic cord may not have closed tightly. Years later, the person moves or lifts heavy objects, and then a hernia develops. A hernia can develop slowly caused by lifting and straining over a period of time; for example, lifting heaving objects or straining due to chronic constipation.

c. **Signs/Symptoms.** The typical inguinal hernia is first evidenced by a bulge in the groin, accompanied by mild pain. The bulge is the organ pushing out in the hernial sac which is not only visible but palpable. The mild pain at the beginning of this problem progresses to more severe pain. The person experiences a heavy, dragging sensation which becomes heavier when he exercises strenuously, strains, or coughs. There is tenderness around the hernia when the person strains.

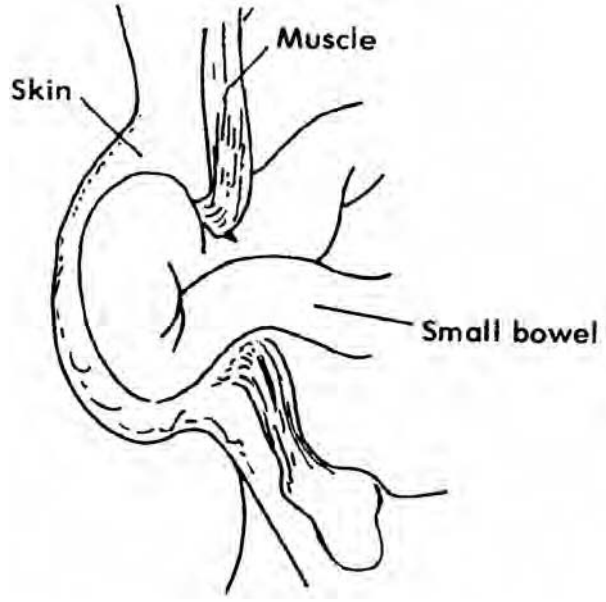


Figure 3-8. Inguinal hernia.

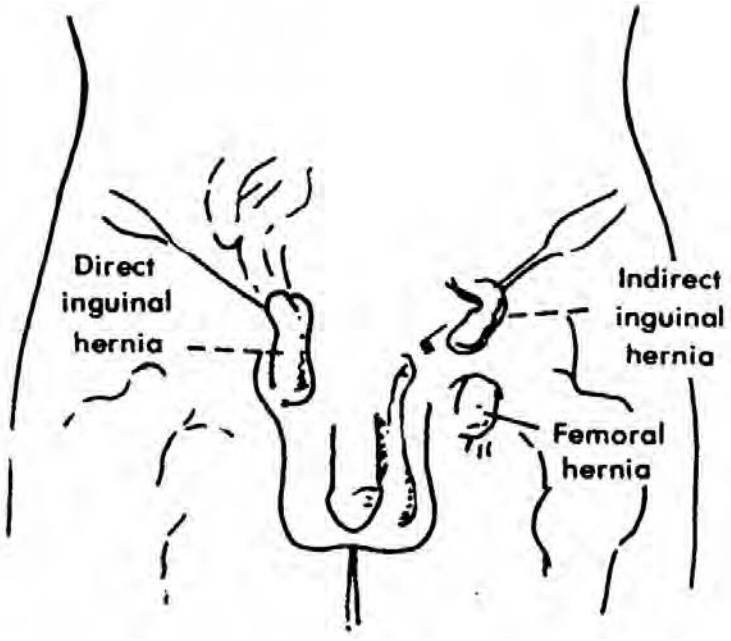


Figure 3-9. Different types of inguinal hernias.

d. **Diagnosis.** An inguinal hernia is usually diagnosed by examination rather than by patient history. Begin by asking the patient to stand while you sit. Perform an inspection by examination. Look at the inguinal area carefully for bulges. While you continue looking, ask the patient to strain down. Next, examine by palpation. Use your right hand when palpating the patient's right side and your left hand when palpating the patient's left side. Place the index finger of the hand you are using inside the loose scrotal skin as shown in figure 3-10. Beginning at a point low enough so that your finger can move with ease, follow the spermatic cord upward to the triangular slit-like opening of the external inguinal ring. You may be able to put your finger through the inguinal ring if it is somewhat enlarged. Gently, move your finger, if possible, along the inguinal canal. Have your finger either at the external ring or in the inguinal canal and ask the patient to cough or strain down. Feel for any palpable herniating mass as it touches your finger.

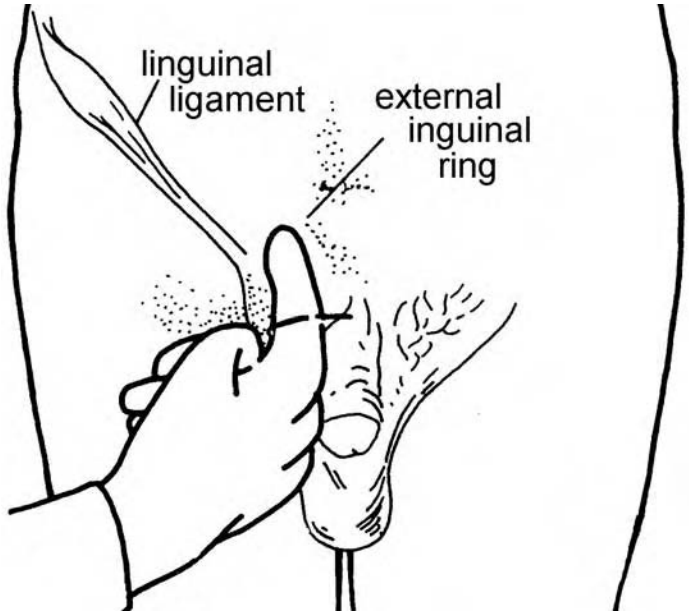


Figure 3-10. Palpation of an inguinal hernia.

e. **Treatment.** Generally, whether or not an inguinal hernia hurts, it is a potential hazard and requires surgical correction. A piece of intestine can be trapped in the bulge. The protruding intestine may swell and/or the hole through which it has protruded may get smaller making it impossible for the organ to move back into the abdominal cavity. The hernia is then called an incarcerated hernia. Of a more serious nature is a strangulated hernia. If the incarcerated hernia does not receive prompt surgical attention, the hole through which the organ protrudes can become so tight that the blood supply to the protruding intestine is cut off. This can lead to death of the tissue and subsequent death of the patient unless emergency surgery is performed resectioning the entrapped intestine. (The part of the intestine caught in the opening is removed and the rest of the intestine connected.) It is much better to repair a hernia on a nonemergency basis, if possible.

(1) Uncomplicated inguinal hernia. Until surgery can be performed, follow this treatment:

(a) Bed rest for 24 hours.

(b) Light diet.

(c) Mild analgesics (medicine for pain).

(d) Cold packs.

(e) No pressure on the bulging mass.

(2) Complicated inguinal hernia. Follow this treatment until surgery can be performed:

(a) The patient must have absolute bed rest. Be sure his knees are flexed.

(b) Begin intravenous therapy and allow the patient no food by mouth.

(c) Place the patient in the Trendelenburg position to reduce the possibility of shock and to decrease pressure on organs inside the abdomen.

(d) Scrotal support.

(e) Surgical consultation.

3-10. PREVENTION OF HERNIAS

It really isn't possible to prevent a hernia. Even a cough or a sneeze can cause a weak spot to give way, allow organs to go through a hole, thus producing a hernia. There are, however, some precautions that are good for many parts of the body and which may prevent a hernia from occurring. Precautions include the following:

a. Don't plunge into heavy work suddenly. Condition your body slowly by gradually strengthening your muscles over a period of weeks.

b. Carry and support heavy objects on your shoulders not on your hips. Do not reach over your shoulders to lift heavy objects.

c. Follow this procedure to lift something heavy. Squat with bent knees and a straight back, your feet about a foot apart and close to the object. Lift the object close to your body. Hold the object against you and stand by straightening your knees. Avoid lifting heavy objects by yourself, if possible. Have someone else help you or use a mechanical device.

d. Adjust your diet to avoid constipation and straining to move the bowels. Include such foods as whole grains, fresh fruits, vegetables, and six glasses of water in your daily diet to keep your system regular.

Section III. DISEASES/DISORDERS OF THE LOWER GASTROINTESTINAL SYSTEM

3-11. DIARRHEA

Organs of the lower gastrointestinal system are concerned with absorption and excretion of waste. The small intestine absorbs nutrients. The large intestine absorbs water and eliminates solid waste. Disease in this part of the gastrointestinal system can disrupt the digestive process.

a. **Definition.** Diarrhea may be defined as the passage of several semisolid or unformed stools in rapid succession. A more common definition of diarrhea is loose, watery stools, usually occurring frequently. The passage of a single, loose stool does not constitute diarrhea. In determining whether a person has diarrhea, the consistency of stools is considered rather than the frequency of stools.

b. **Etiology.** Diarrhea may be caused by many factors. The basic cause of diarrhea is an increase in peristalsis, wavelike movements which propel the products of digestion rapidly through the gastrointestinal tract. If the contents move too rapidly, a smaller amount of water from the contents is absorbed into the large intestine, and the stool becomes either soft or liquid. The gastric contents have not stayed in the large intestine long enough to have sufficient water absorbed into the intestinal wall. A person who overuses laxatives may have diarrhea. Intestinal infections such as diverticulitis infection by staphylococcus bacilli, salmonella bacilli, viral enteritis, and cholera all can cause diarrhea. Some antibiotics such as tetracycline may cause diarrhea. Some individuals may have intolerance for certain foods. Particular foods may cause malabsorption (impaired intestinal absorption of nutrients); stimulus (the food stimulates the digestive system to hyperactivity), or sudden peristalsis (the food causes gastric contents to moved along too rapidly). There are three major problems that may occur with severe and/or prolonged diarrhea: electrolyte imbalances, dehydration, and vitamin deficiencies. Diarrhea due to a disease causing malabsorption may result in a nutritional deficiency.

c. **Symptoms.** Included are the following:

(1) Several watery stools which may be foul smelling.

(2) Abdominal pain or cramping.

(3) Tenesmus--painful, ineffectual straining to defecate.

(4) Flatus--gas or air expelled through the anus.

(5) Thirst--due to loss of body fluids.

(6) Anorexia--loss of appetite.

d. **Treatment.** Treatment may include one or more of the following:

(1) An antidiarrheal agent such as Metamucil®, diphenoxylate HCl with atropine sulfate (Lomotil®), loperamide HCl (Imodium), opium tincture deodorized, or camphorated tincture of opium (paregoric). Combination products may be given such as Kaopectate® (kaolin and pectin), Parelixir® (tincture of opium and pectin), or Donnagel® (kaolin, pectin, hyoscyamine, atropine, scopolamine).

(2) Replace fluids and electrolytes either orally or intravenously.

(3) Adjust the diet. Eliminate foods that may cause diarrhea such as raw vegetables and fruits, fried foods, bran, whole grain cereals, preserves, syrups, candies, pickles, relishes, spices, coffee, and alcoholic beverages. When diarrhea is severe, allow no foods by mouth and maintain intravenous feedings. Progress to clear liquids if tolerated, then advance the patient to a soft, bland diet followed by other foods as tolerated.

(4) Severe cases of diarrhea may require treatment aimed specifically at the cause of the illness.

3-12. CONSTIPATION

a. **Definition.** Constipation is difficult or infrequent passage of feces with the stools abnormally dry. Hard, dry stools usually occurring infrequently is another definition of constipation. The frequency of bowel movements differs greatly from person to person. Bowel movements every other day are normal for some individuals; others have two or three movements each day. Infrequent bowel movements do not mean an individual is constipated unless the time between movements is abnormal for that particular person. Types of constipation include chronic and acute.

b. **Etiology.** A variety of factors can cause constipation. Included are the following:

(1) Altered diet lacking the necessary bulk food and fluid intake.

(2) Changed physical activity such as prolonged bed rest.

(3) Obstruction in the digestive system such as colonic or rectal lesions.

(4) Inadequate propulsion of gastric contents by peristalsis.

(5) Weak intestinal muscle tone.

(6) Use of drugs such as narcotics, diuretics, calcium, iron, and aluminum hydroxide or aluminum phosphate gels.

c. **Symptoms.** Included are the following:

(1) Feeling of fullness.

(2) Pressure in the rectum.

(3) Frequent urge to defecate.

(4) Hard and dry stools.

(5) Fecal impaction--hardened or putty-like stools in the rectum or colon. Such stools may interfere with the passage of feces.

(6) Possible anal lesions.

d. **Treatment.** For most patients, the goal is to help the person learn to maintain habits that foster normal elimination. To do this, the patient must follow a balanced diet, maintain a high fluid intake, get regular rest and exercise, and set aside a regular time after a meal for a bowel movement.

(1) Diet. Diet must include the following:

(a) Sufficient amount of food as well as food high in fiber. Bran, raw fruits, and vegetables are helpful.

(b) Increase stewed or raw vegetables or fruits unless otherwise indicated.

(c) Drink six to eight glasses of fluid per day. A mild natural laxative action is produced by drinking a glass of hot water half an hour before breakfast.

(2) Exercise. The patient must have moderate physical exercise. It is important for the abdominal muscles to be well toned. If necessary, physical therapy may be recommended for those with a front-bulging abdomen.

(3) Medication. A cathartic such as castor oil may be used. A cathartic is a drug which softens the stool by increasing the motor activity of the intestine. Cathartics are different from laxatives; laxatives produce a milder effect.

3-13. APPENDICITIS

a. **Definition.** Appendicitis is the inflammation of the vermiform appendix. The appendix, a narrow, blind tube located at the tip of the cecum, becomes inflamed.

b. **Etiology.** An obstruction occurs, and the contents of the appendix cannot empty normally. The obstruction may be a fecalith (a hardened piece of stool), inflammation, a foreign body, or a tumor. The intestinal contents locked in the appendix are full of bacteria. Prolonged contact of this bacteria with the tissues of the appendix often produces infection. Infection of the appendix occurs quickly followed by inflammation. Perforation occurs if inflammation weakens the appendix tissues. Perforation is a dangerous complication because if the intestinal contents spill into the peritoneal cavity, the result can be generalized peritonitis or an abscess.

c. **Signs and Symptoms.** Appendicitis seems to be more common among adolescents and young adults, but this disorder can occur at any age. The most common initial symptom is an attack of severe abdominal pain. Signs and symptoms progress in this manner:

(1) At first, pain is generalized in the abdominal area. Later, the pain becomes concentrated in the right, lower quadrant of the abdomen. The most severe pain is usually midway between the umbilicus and the right iliac crest at a point called McBurney's point.

(2) Next, loss of appetite, moderate feeling of being sick, slight fever (up to 102ºF) and mild nausea.

(3) Vomiting, if it occurs, appears next.

(4) Eventually (from 2 to 12 hours), pain shifts to the right side localizing in the right lower quadrant.

(5) Pain persists as a steady soreness made worse by walking or coughing. The patient finds that he is most comfortable lying still and drawing the right leg up to relieve tension on the abdominal muscles.

(6) Constipation usually, but sometimes diarrhea.

(7) Rectal tenderness.

(8) Bowel sounds are diminished or absent.

NOTE: Ninety-five percent of appendicitis cases have a tendency to become progressively worse and develop the complication of perforation.

d. **Diagnosis.**

(1) The patient can usually point to the location of pain. If the patient is asked to cough, the main point of pain will be one-third the distance from the anterior iliac crest to the umbilicus.

(2) Since perforation rarely occurs during the first eight hours of signs and symptoms, it is generally safe to observe for diagnosis during this time.

(3) There is a moderate increase in the number of leukocytes in the blood (leukocytosis--10 to 20 thousand) with an increase in white blood cells, specifically the neutrophils.

e. **Treatment.**

(1) Before surgical facilities are available, have the patient follow this procedure:

(a) Bed rest in the semi-Fowler's position.

(b) Nothing by mouth. Give intravenous fluids as necessary, and keep an accurate record of the patient's fluid intake and output.

(c) Ice bag to the abdomen. **DO NOT apply heat to the appendix site.**

(d) Prophylactic antibiotics or analgesics may be given at the discretion of the surgeon.

(e) **DO NOT give laxatives or enemas**.

(2) When surgical facilities are available, the appendix should be removed.

3-14. DIVERTICULOSIS

a. **Definition.** The disease diverticulum of the colon is a protruding of the intestinal mucosa to form a sac. Diverticulosis is the condition when these protruding sacs are not inflamed and cause no symptoms. The condition becomes diverticulitis when feces become trapped in the sacs causing the diverticula to become inflamed and painful.

b. **Etiology.** The tendency to have diverticulosis may be congenital or acquired with acquired being the most common cause. Diverticulosis usually occurs in the sigmoid colon as a result of the normal aging process from thirty to eighty-five years of age. Diverticula (the plural of diverticulum) develop at the weak point where blood vessels penetrate the wall of the colon. It is thought that the lack of bulk in American and Western European diets is a factor in causing diverticula. Lack of bulk along with high intraluminal pressure increases the tendency toward development of diverticula.

c. **Complications.** Patients have no symptoms until diverticula become obstructed and inflamed. Diverticulitis is the name of the condition then. Diverticulitis probably affects twenty to twenty-five percent of patients with diverticulosis.

d. **Symptoms of Diverticulitis.** Diverticulitis is common in persons over thirty-five and in those who are obese. Diverticulitis pain is usually a dull pain in the lower left quadrant of mid-abdominal region; the pain may radiate to the back. This pain may last a few hours or a few days and then subside. Other symptoms include bowel irregularity, constipation, diarrhea, rectal bleeding, fever, nausea, and vomiting. If there is massive hemorrhage, gross or microscopic perforation of the diverticulum has occurred. Inflammation of diverticula may affect the urinary bladder causing the patient to urinate with increased frequency, experience pain or difficulty during urination, and have gas or air in the urine (pneumaturia).

e. **Treatment of Uncomplicated Diverticulitis.** Follow this plan:

(1) Low residue diet. Avoid foods which leave a coarse residue such as berries, nuts, and skins of fruits.

(2) Give bulk additives. If the patient tends to be constipated, give bulk-forming substances such as Metamucil.

CAUTION: Metamucil may cause bowel obstruction.

(3) Give anticholinergics. Give Donnatal®, Librax®, or Pro-Banthine® to slow down the motility and reduce the irritability of the colon.

f. **Treatment of Complicated Diverticulitis.** In cases of acute diverticulitis, the patient should be on bed rest until surgical repair can be performed. Give antibiotics and supportive therapy as for appendicitis. See paragraph 3-13e, treatment.

NOTE: The usual case of diverticulitis is mild and responds well to dietary measures and antibiotics.

3-15. HEMORRHOIDS

a. **Definition.** Hemorrhoids (piles) are enlarged and varicose condition of the veins of the lower portion of the rectum and the tissues about the anus. These varicose veins may occur outside the anal sphincter (external hemorrhoids) or inside the anal sphincter (internal hemorrhoids). External hemorrhoids are sensitive and painful. Internal hemorrhoids are covered with mucous tissues and are insensitive to pain.

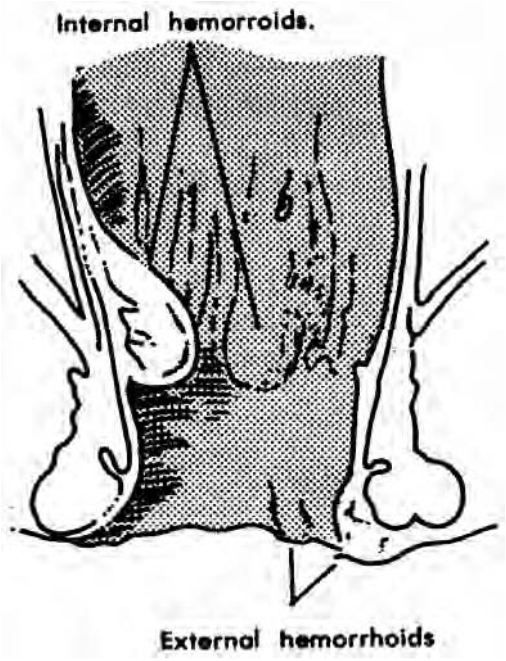


Figure 3-11. Internal and eternal hemorrhoids.

b. **Etiology.** Causes of hemorrhoids include straining at stools, constipation, and prolonged sitting, standing, or squatting. The pressure of pregnancy causes hemorrhoids which usually disappear when the pregnancy ends. Anal infections are another cause of hemorrhoids.

c. **Sign and Symptoms.** Anal discomfort and pain may become more severe when the patient has a bowel movement. Itching (pruritus) is another uncomfortable symptom. Mild hemorrhaging may occur.

d. **Treatment.**

(1) General treatment. In most cases, conservative treatment of hemorrhoids is successful. Some hemorrhoids may be relieved by Sitz bath which reduces local pain, swelling, or infection. Suppositories containing hydrochloric acid lessen the discomfort of pain and itching. Anesthetic ointment such as Dibucaine applied to the affected area may be used. Some commercial products cause irritation to the hemorrhoids. If possible, the patient should rest with his head lower than the rest of his body to relieve the pressure on the hemorrhoids.

(2) Removal of thrombosed eternal hemorrhoid. A vein ruptures at the anal margin and forms a blood clot in the subcutaneous tissue. This condition is a thrombosed external hemorrhoid. The patient feels a painful lump. Examination reveals a tense, tender, bluish mass covered with skin. If the hemorrhoid is less than seventy-two hours old, it can be removed locally by following this procedure. Wash the area with antiseptic. Apply one percent lidocaine around and over the lump. Make a radial ellipse skin incision and remove the clot.

(3) Surgery. Complicated or extensive cases may require surgery.

3-16. ANAL FISSURE

a. **Definition.** An anal fissure is a linear ulcer on the border of the anus. Such an ulcer involves the skin of anal wall.

b. **Etiology.** This condition is caused by straining to have bowel movements.

c. **Signs and Symptoms.** Chronic anal fissure is characterized by chronic acute pain during and after bowel movements. Afraid of pain, the person may become constipated. The condition tends to occur over and over with the fissure healing and then developing again. Constipation reactivates the condition.

d. **Diagnosis.** Anal fissures are frequently misdiagnosed as hemorrhoids. A skin tag protruding from the anal border (a sentinal pile tag) is an indication of anal fissure. Pull the buttocks apart and partially turn the anal canal outward. Examine by inspection for anal fissure. Gently palpate the area; an anal fissure will be tender.

e. **Treatment.** Treatment includes conservative measures such as the following:

(1) Establish a schedule of regular bowel movements.

(2) Give stool softeners and bland laxatives; for example, mineral oil.

(3) Have the patient take Sitz baths.

(4) Administer suppositories with steroids such as Anusol.

(5) May require stretching of the anal muscle.

(6) If these measures fail, surgical division of the internal anal muscle may be necessary.

3-17. ANORECTAL INFECTION

a. **Definition.** Anorectal infections are infections of the anus and rectum. Two phases of anorectal infection will be dealt with here: anal abscess (the acute phase) and anal fistula (the chronic phase).

b. **Anal Abscess.** An anal abscess is an acute, localized infection of an anal or rectal gland most commonly caused by staphylococci. Signs and symptoms include a severe throbbing pain initiated by defecation; the pain persists for many hours after defecation. The patient feels a vague pelvic pain and may have fever. Rectal examination may detect a tender, boggy swelling. There may be swelling of the lymph nodes in the groin area. Treatment should be prompt without waiting for the abscess to come to a head externally. This condition may be life threatening if the abscess drains into the abdomen. An incision must be made and the abscess drained. Give antibiotics only when the infection has become widespread. For a widespread infection, Sitz baths or antibiotic therapy or a combination of both may be used.

c. **Anal Fistula.** In this condition, a tube-like tract opens on one end into the anal canal and on the other end into the skin around the anus. The cause is usually pus-producing abscesses draining spontaneously or surgically opened to drain. A patient with a history of abscesses that go away and come again is liable to have anal fistula. Fistulotomy, surgical incision of the fistula, is the only effective treatment.

3-18. PILONIDAL FISTULA

a. **Definition.** This is a fistula (an unnatural passage between two areas of the body) near the rectum which results from a growth of subcutaneous hair. The fistula occurs at the base of the spine in the intergluteal cleft, the area in the middle of the body where the buttocks start. Hair frequently comes out of a pilonidal fistula which is the origin of the name--pilonidal means a nest of hair. This problem is common in military personnel and is frequently called "jeep disease."

b. **Signs and Symptoms.** Pilonidal fistulas occur in the subcutaneous layer of the skin. Pain, tenderness, and induration (an abnormally hard spot) indicate that a fistula has developed. There may be one or several cutaneous openings on the body's midline. Fistulas are commonly found in the midline post anal dimple. The inflammatory process of the fistula may subside without any treatment, or it may progress until it ruptures or requires surgical drainage.

c. **Treatment.** If necessary, local anesthetic can be used and the fistula drained. Then, pack the abscess cavity with iodoform gauze daily and irrigate with a solution of hydrogen peroxide. Chronic cases require more extensive surgery. Treatment is necessary because untreated cases may result in long-draining sinuses.

CAUTION: Pilonidal fistulas tend to recur; therefore, take care when examining the patient. Also, tell him to avoid sitting too long in one position. If he must sit for long periods of time, tell him to change sitting position frequently.

3-19. PRURITUS ANI

a. **Definition.** Pruritus ani is severe anal itching. The itching sensation is usually more acute at night or during periods of inactivity. Warmth and scratching make the condition worse.

b. **Etiology.** The chief causes are poor hygiene and tight, nonabsorbent clothing. Urinary of fecal incontinence, anal fissure, or hemorrhoids can cause this itching. Bacteria, fungi, yeast, trichomonads, or intestinal parasites can result in anal itching. An individual with proctitis (inflammation of the rectum) or a person with rectal prolapse (the rectal mucous membrane bulges through the anus) may have pruritus ani.

c. **Diagnosis.** Thorough examination of the perianal skin, anal canal, and rectum with a proctoscope (instrument used to inspect the rectum) is used in the diagnosis. Take skin scrapings to check for fungus. Also, check for ovum and parasites to determine if these are the cause of the severe itching.

d. **Treatment.** If the specific cause of pruritus ani is found, eliminate that cause. If the specific cause cannot be found, treat the symptoms. Follow these guidelines:

(1) Improve personal hygiene. Keep the area clean. After each bowel movement, clean the area with moist toilet tissue or a cloth. Use bland, unscented, nonmedicated soaps, or mild detergents such as pHisHex. Blot the area dry; do not rub or scratch.

(2) Lukewarm sitz baths or cool compresses of Burow's solution may be used to sooth the area.

(3) Shake lotions such as noncarbolated calamine or dusting powders such as plain talc or cornstarch can be used to dry and protect the area.

Section IV. DISEASES/DISORDERS OF THE ACCESSORY ORGANS

3-20. THE ACCESSORY ORGANS

Accessory organs of the gastrointestinal system include the liver and gallbladder. The liver is the largest glandular organ in the body and is involved in vital, complex metabolic activities. Liver functions include the formation and excretion of bile; utilization, transformation, and distribution of vitamins, proteins, fats, and carbohydrates; detoxification of chemicals (including drugs), bacteria, and foreign elements that may be harmful, and the formation of antibodies and immunizing substances, including gamma globulin. Cirrhosis of the liver is a disease which can drastically interrupt or stop these important liver functions. The gallbladder receives bile made by the liver, changes the bile by absorbing water and minerals so that the bile is more concentrated, and releases the bile when it is needed. Problems involving gallbladder can result in acute cholecystitis and/or cholelithiasis.

3-21. LIVER DISORDERS

a. **Cirrhosis of the Liver.**

(1) Definition. Cirrhosis is a chronic disease of the liver in which the liver is first damaged and then an excess of fibrous tissue develops. As the liver tries to repair the damage, scarring develops, and eventually blood cannot flow through its normal channels in the liver. Liver cells cannot regenerate.

(2) Etiology. A variety of agents may damage the liver cells and the liver's connective tissue. Chronic gastroenteritis (chronic inflammation of the gastrointestinal tract) may impair liver function. Streptococcus infections and Schistosoma (blood flukes which are parasites in man and animals) may lead to liver cirrhosis. Chemicals including alcohol as well as carbon tetrachloride, arsenic, and lead can lead to cirrhosis. Obstruction of the biliary ducts when complicated by inflammation is a frequent cause of cirrhosis. The result is that necrotic liver cells are damaged. Liver cells cannot grow new cells to replace damaged ones. Instead, connective tissue replaces the cells with tissue containing fibers.

(3) Signs and symptoms. General signs of liver damage occur. Early signs include gastrointestinal disturbances, indigestion (dyspepsia), change in bowel habits, and chronic gastritis (chronic inflammation of the stomach). Later in the disease, these signs and symptoms occur: fever, liver enlargement, gradual weight loss, and accumulation of fluid in the peritoneal cavity (ascites).

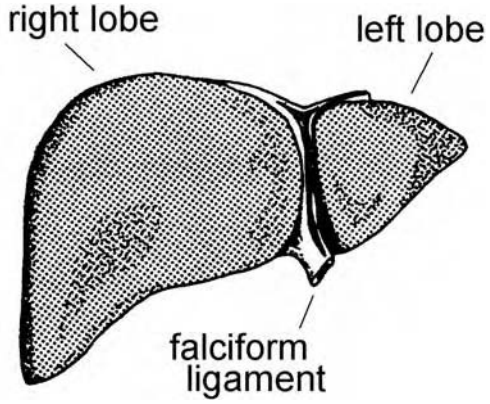


Figure 3-12. Normal liver.

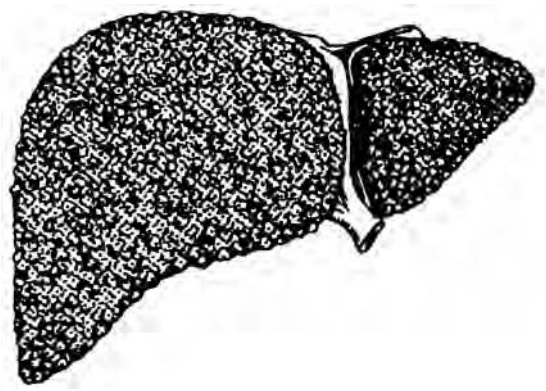


Figure 3-13. Typical alcoholic cirrhosis of the liver.

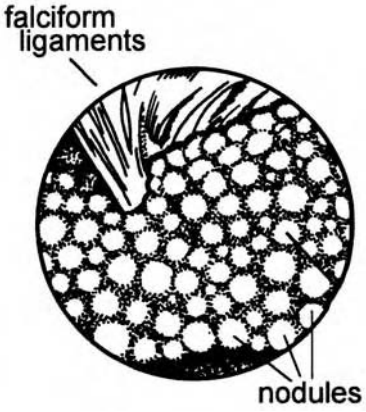


Figure 3-14. Top view of alcoholic cirrhosis showing typical nodules.

(4) Treatment. There is no one cure for cirrhosis. Instead, treatment tries to prevent further deterioration of the liver. The causes of the problem should be eliminated, if possible, in an effort to help the liver function as normally as possible. If treatment begins early when the patient has mild and few symptoms, the chance of recovery is good. Treatment begun later when the patient is jaundiced, experiencing protein deficiency, and retaining fluid in the peritoneal cavity is not likely to be very successful. General measures to be followed include:

(a) Bed rest when fever occurs.

(b) High protein diet. Diet is very important in treatment. In addition to high protein, the diet should include large amounts of carbohydrates and vitamins with as little fat as possible. If the patient develops water retention, fluid and salt intake may have to be restricted. Omit spices from the diet entirely.

(c) No alcohol.

(d) Control or reduce severe itching (pruritus).

(e) Hospitalize the patient if necessary.

b. **Hepatitis.** Hepatitis is inflammation of the liver. This disease can be caused by viruses, drugs, and chemicals, including alcohol. Hepatitis can cause damage to the intestines and other organs; however, the greatest damage is done to the liver cells. These cells may be so badly damaged that they die. In fatal cases, the liver has been damaged so severely that the normal functions of bile secretion or excretion have not occurred. Consequently, jaundice developed in addition to the metabolic dysfunction which caused the death of liver cells. Refer to Lesson 7, Hepatitis, in this subcourse for further information on this liver disease.

3-22. GALLBLADDER DISEASES AND DISORDERS

a. Acute Cholecystitis

(1) Definition. Acute cholecystitis is inflammation of the gallbladder. In ninety percent of the cases, this condition is associated with gallstones.

(2) Etiology. Usually, gallstones lodge in the neck of the gallbladder or the cystic duct and interfere with bile drainage. If the obstruction is not removed, pressure builds up in the gallbladder, and inflammation develops. Acute cholecystitis may develop at any age, but it is most common among fair- complexioned women who are overweight and over forty.

(3) Signs and symptoms. Included are the following:

(a) Intolerance of fatty foods or heavy meals. The patient may experience belching, nausea, and right upper abdominal discomfort with pain and cramps after a meal containing fried, greasy, spicy, or fatty foods.

(b) A low-grade fever, chills, and a light increase in the white blood count when inflammation of the gallbladder is severe.

(c) Pain in the right upper quadrant of the abdomen or pain radiating to the scapula and right shoulder. (Pain felt in the shoulder region is caused by a connection with the phrenic nerve; such pain is called "referred pain.")

(d) Rigid abdominal muscles, shallow respirations, and increased pulse rate when pain is severe.

(e) Prolonged gallbladder attack may cause liver damage with these symptoms: jaundice, pruritus, dark urine, and clay-colored stools.

(4) Treatment. Examine the urine and stool to make a diagnosis. Surgery to remove the stones from the gallbladder may be indicated. Eventually, the gallbladder may have to be removed.

b. **Cholelithiasis.**

(1) Definition. Cholelithiasis is the presence or formation of gallstones. Gallstones can be classified according to chemical composition. Some stones are primarily composed of cholesterol while other stones contain calcium bilirubinate. Thirty to forty percent of the gallstones found in Japan are of the calcium bilirubinate type while less than five percent of the stones found in the United States and Europe are of this variety.

(2) Etiology. The exact reason gallstones form is not know. The method of formation is known. In the case of stones with a cholesterol center, a disturbance between the amount of cholesterol in the bile and its ability to be dissolved in the bile causes the cholesterol to separate and fuse into a single crystal. This is the beginning of ninety-five percent of all gallstones. These stones can move into positions in which they obstruct the outflow of bile from the gallbladder and irritate the gallbladder mucosal surface. The obstruction and irritation combined with bacteria cause other substances to adhere to the crystals; substances such as calcium, inorganic salts, and bilirubin. Additional causes of gallstones include the following:

(a) Inflammation of the mucous membrane of the cystic duct with a free discharge, a condition which might cause an obstruction of the cystic duct.

(b) Disturbances affecting the autonomic innervation of the biliary system.

(c) Infection produced by blood or flowing back from the duodenum. Bacteria sometimes invade the gallbladder.

(d) Vitamin A deficiency. Stones have been found in experimental animals when a Vitamin A deficiency has been created.

(e) Waste materials of altered bile metabolism. Such materials are the beginning of calculi crystals.

(3) Signs and symptoms. There may be no symptoms, or the patient may experience symptoms similar to those for acute cholecystitis. If the gallbladder is obstructed and cannot empty normally, pressure increases, and the patient may have intense pain (biliary or gallstone colic). The pain may radiate to the right shoulder or lower back. When fluid which should leave the gallbladder cannot, bacteria increases, and the action of the bacteria causes the patient to have a fever. Patients with gallstone colic may experience severe pain during these attacks and then be free of pain.

(4) Treatment. Medical treatment includes dietary control. The patient should eat foods low in fat and high in proteins and carbohydrates. Surgery is usually indicated but only if the physician is sure the problem is cholelithiasis.

3-23. CLOSING

The symptoms of many of the diseases and disorders of the gastrointestinal system are similar. Look at your patient as a whole person. Treat the most life-threatening or potentially life-threatening problems first. Many of the other illnesses discussed here will require only supportive care in order to allow the soldier to return to duty as quickly as possible.

Continue with Exercises

EXERCISES, LESSON 3

INSTRUCTIONS. Answer the following exercises by writing the answer in the space provided.

After you have completed all of these exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. _____, also known as heartburn, is an eating disorder that causes a burning sensation in the person's esophagus.

2. Inflammation of the esophagus which spreads through that organ is called

   _____.

3. List three causes of rupture of the esophageal varices.

   a. _____.

   b. _____.

   c. _____.

4. An acute or chronic ulceration in the lining of the stomach or the duodenum is a

   _____ ulcer.

5. Gnawing, burning, aching, or hunger pangs with stomach distress relieved by eating, antacids, or vomiting are characteristics of _____ a ulcer.

6. A _____ ulcer is an open lesion which is located in the lesser curve of the stomach.

7. A hernia is a condition in which _____

   _____

8. What is a hernial sac? _____

_____

9. What is the location of an inguinal hernia? _____

_____

10. Acute, simple gastritis is _____

_____

11. List three causes of acute, simple gastritis.

    a. _____.

    b. _____.

    c. _____.

12. Where does an incisional hernia occur on the body? _____

_____

13. In an inguinal hernia, a loop of intestine slips through the inguinal canal and appears as a bulge in the _____ or _____ of a male.

14. List two possible causes of inguinal hernias.

    a. _____.

    b. _____.

15. What is an incarcerated hernia? _____

_____

16. _____ is the passage of several semisolid or unformed stools in rapid succession.

17. The difficult or infrequent passage of feces with abnormally dry stools is termed

_____

18. The inflammation of the vermiform appendix brought on by an obstruction which prevents the appendix from emptying normally is the definition of _____

19. What is the difference between diverticulosis and diverticulitis? _____

_____

20. _____ is severe anal itching, usually more acute at night or during periods of inactivity.

21. List two early signs of cirrhosis of the liver.

    a. _____.

    b. _____.

22. _____, the most frequent complication of a peptic ulcer, occurs when the walls of a blood vessel are worn away by the ulcer.

23. _____ is a complication in which the ulcer erodes through the wall of an organ.

24. If an ulcer extends beyond the duodenal wall into an adjacent organ, the complication is called _____.

25. What is an umbilical hernia? _____

_____

26. _____ hernia is the one type of hernia that may respond to treatment of medication, bedrest, etc. without resorting to surgery.

27. _____ are veins in the lower portion of the rectum and tissues around the anus that are enlarged and varicose.

28. A linear ulcer on the border of the anus is called a/an _____.

29. What is anal fistula? _____

_____

30. Pain, tenderness, and induration in the subcutaneous layer of the skin near the rectum is the definition of _____.

31. List two symptoms of the peptic ulcer complication termed obstruction.

    a. _____.

    b. _____.

32. What is the primary objective of medication treatment for peptic ulcer? _____

_____

33. List two general guidelines to follow in dietary management of a peptic ulcer.

    a. _____.

    b. _____.

34. _____ is inflammation of the gallbladder; _____ is the presence or formation of gallstones.

35. What is a strangulated hernia? _____

_____

36. List two reasons for not using a truss to treat a hernia.

a. _____.

b. _____.

37. Not all hernias are preventable; nevertheless, there are some precautions which can be taken to avoid developing a hernia. List three such precautions.

a. _____.

b. _____.

c. _____.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 3

1. Pyrosis. (para 3-3a(1))

2. Reflux esophagitis. (para 3-3b(1))

3. You are correct if you listed any three of the following:

   Muscular strain from coughing and vomiting.
   Esophagitis.
   Poorly chewed foods.
   History of alcoholism. (para 3-3c(4))

4. Peptic. (para 3-4b(1))

5. Duodenal. (para 3-4b(3))

6. Gastric. (para 3-4b(4))

7. A structure, organ, or part of an organ protrudes out through the wall of its body cavity. (para 3-5)

8. A hernial sac is the tissue pouch which encloses the bulging organ or structure (the hernia). (para 3-5)

9. An inguinal hernia occurs at the inguinal ring (the point on the abdominal wall where the inguinal canal begins. (para 3-6)

10. An acute inflammation and erosion of the lining of the stomach. (para 3-4a(1))

11. You are correct if you listed any three of the following:

    Chemical irritants.
    Bacterial infections or toxins.
    Viral infections.
    Allergy.
    Ingestion of poisons.
    Dietary indiscretions. (para 3-4a(2))

12. An incisional hernia occurs through the scar of a surgical incision. (para 3-6)

13. Groin or scrotum. (para 3-9a)

14. You are correct if you listed any two of the following:

    Congenital weakness in a cavity wall.
    Lifting heavy objects.
    Straining as in chronic constipation. (para 3-9b)

15. An incarcerated hernia is a condition in which a loop of intestine has broken the femoral ring and is held fast. (para 3-9e)

16. Diarrhea. (para 3-11a)

17. Constipation. (para 3-12a)

18. Appendicitis. (para 3-13a and b)

19. Diverticulosis is the condition of bulging or protruding intestinal mucosa to form a sac. Diverticulitis is the condition of the sac being inflamed. (para 3-14)

20. Pruritus ani. (para 3-19)

21. You are correct if you listed any two of the following:

    Gastrointestinal disturbances.
    Indigestion.
    Change in bowel habits.
    Chronic gastritis. (para 3-21a(3))

22. Hemorrhaging. (para 3-4b(5)(a))

23. Perforation. (para 3-4b(5)(b))

24. Penetration. (para 3-4b(5)(c))

25. An umbilical hernia is a hernia in which part of the intestine has bulged through the umbilical ring (the navel). (para 3-8a(2))

26. Hiatal. (para 3-7d)

27. Hemorrhoids. (para 3-15a)

28. An anal fissure. (para 3-16a)

29. An anal fistula is a tube-like tract opening on one end into the anal canal and on the other end into the surrounding skin around the anus. (para 3-17c)

30. Pilonidal fistula. (para 3-18b)

31. Vomiting after eating.
Fullness feeling after eating. (para 3-4b(5)d))

32. The primary objective is to provide the best conditions for the ulcer to heal. (para 3-4b(6))

33. You are correct if you listed any three of the following:

Eat nutritious, regular meals.
Restrict the amount or avoid coffee, tea, and colas.
Avoid specific foods which irritate the condition. (para 3-4b(6))

34. Acute cholecystitis. (para 3-22a(1))
Cholelithiasis. (para 3-22b(1))

35. The intestinal flow and the blood supply in intestinal tissues are both stopped in a strangulated hernia. (para 3-8a(1))

36. You are correct if you listed any two of the following:

A truss can lead to pressure sores.
It can cause the breakdown of underlying tissues.
It does not cure a hernia. (para 3-8e)

37. You are correct if you listed any three of the following:

Condition your body slowly to heavy work by strengthening your muscles over a period of time gradually.
Carry and support heavy objects on your shoulders, not your hips.
Do not reach over your shoulders to lift heavy objects.
To lift a heavy object, squat, hold the object close to you, and stand by straightening your knees.
If possible, have someone help you when lifting heavy objects.
Adjust your diet to include whole grains, fresh fruits, vegetables, and six glasses of water daily to keep your system regular. (para 3-10)

End of Lesson 3

LESSON ASSIGNMENT

LESSON 4 Ingested Poisons.

LESSON ASSIGNMENT Paragraphs 4-1 through 4-10.

OBJECTIVES After completing this lesson, you should be able to:

4-1. Identify the principles and categories of ingested poisons.

4-2. Identify therapeutic procedures for removing ingested poisons by emesis, absorption, gastric lavage, dilution, demulcent, excretion, diuresis, cathartics, and dialysis.

4-3. Identify signs/symptoms and treatment for ingested chemical poisoning.

4-4. Identify signs/symptoms and treatment for ingested metal poisoning.

4-5. Identify signs/symptoms and treatment for ingested salicylate poisoning.

4-6. Identify signs/symptoms and treatment for ingested ethyl alcohol poisoning.

4-7. Identify signs/symptoms and treatment for ingested methyl alcohol poisoning.

4-8. Identify signs/symptoms and treatment for ingested petroleum poisoning.

4-9. Identify signs/symptoms and treatment for ingested vegetation poisoning.

4-10. Identify signs/symptoms and treatment for food poisoning.

4-11. Identify poison control centers and reference books for poisonings.

SUGGESTION After completing the assignment, complete the exercises of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 4

INGESTED POISONS

4-1. INTRODUCTION

a. The number of poisoning victims increases each year. More and more drugs are becoming available, and more and more people are taking drugs. More than 400 children five years of age and younger die in the United States each year from ingested poisons. The annual death toll for all ages is about 1,400 people. There are 500,000 accidental ingestions of poisons each year. With these startling statistics in mind, it is possible that you as a Medical NCO will encounter a person who has ingested poisons.

b. Poisons are dangerous, lethal substances. A poison may be defined as a substance which may, when ingested, cause serious illness or death. Poisons are close at hand in our every day life. There are about a quarter of a million products sold for use in and around the home, products which are poisonous if swallowed or inhaled in large enough quantities. The most hazardous types of substances are listed below:

(1) Drugs and medicines--includes powerful prescription pain-killers and sleeping pills such as aspirin, cough medicine, and liniment.

(2) Insecticides, rodenticides, herbicides, and fungicides.

(3) Solvents--carbon tetrachloride and acetone, for example.

(4) Petroleum distillates--examples include kerosene, gasoline, and light fluid.

(5) Cleaning liquids and powders--detergents, ammonia, bleach, and oven cleaners.

(6) Polishing solutions--including furniture and metal-polishing compounds.

(7) Automotive supplies--for example, brake fluid, antifreeze solutions, and polishes.

(8) Cosmetics--hair dyes, bleaches, hair-curling and hair- straightening solutions, and nail polish removers.

(9) Hobby supplies--glues, cements, paints, and varnishes.

(10) Flakes of lead-based paints--chipped by children from the walls of old houses.

4-2. CATEGORIES OF POISONING

Poisons can be classified in many different ways. Ingested poisons discussed in this lesson are categorized as follows: poisonings by chemicals, poisonings by vegetation, and poisonings by food. Poisonings caused by chemicals include damage done by corrosives, metals, salicylates, alcohol, and petroleum products. A variety of plants are poisonous to humans when eaten. People can also be poisoned by food. Eating too much of some foods, being allergic or hypersensitive to certain foods, or eating food containing certain bacteria or their toxins can all result in food poisoning. Signs, symptoms, and treatment for these three categories of ingested poisons will be discussed later in this lesson.

4-3. GENERAL PRINCIPLES OF POISONINGS

a. **Socioeconomic Factors.** These generalizations can be made regarding poisonings. More poisonings occur in cities than in rural areas. There are more poisonings in low income areas than in high income areas. Lead poisoning from paint occurs more frequently among poor people than among middle or high income people.

b. **General Physical Condition.** The general physical condition of each patient makes a difference in how the patient reacts to poison. Age is important in that infants and children react strongly to ingested poisons. Ill or diseased individuals are more susceptible to ill effects from ingested poisons than those in good physical health. The way ingested poisons affect people also varies depending on race, sex, and the presence of congenital disease. A person can become addicted to certain poisons or drugs when these substances are repeatedly taken in small doses. This causes the buildup of a tolerance for the substance. Some individuals can build up a tolerance for ingested poisons. That is, the person can take poison seemingly without becoming ill. Whether the person feels ill or not, there is always some damage to the body. If this individual takes a little more poison than usual, he is liable to die or become very sick.

c. **Nature of Poisoning.** Basically, poisoning means eating, breathing, or touching any substance which can harm you causing you injury, illness, or death. Terms to become familiar with include acute poisoning and chronic poisoning. Acute poisoning is the condition brought on by taking an overdose of poison at one time (a child eating all the aspirin tablets in a bottle, for example). Chronic poisoning is the condition brought on by taking repeated doses of a poison a long period of time or by absorbing doses of poison over a long period of time. A young child chewing on a baby crib covered with lead paint is an example of poisoning by absorption. Whenever there is an unexplained or acute illness, consider that the person may be suffering from poisoning.

4-4. PATIENT HISTORY

To manage a poisoned patient properly, obtain a patient history relating to the poisoning. Question the patient, family members, and bystanders asking the following:

a. What was taken? If a plant was the source of poison, find out what part of the plant was eaten--roots, leaves, stem, flower, or fruit.

b. When was the poison taken?

c. How much of the poison was taken?

d. Has the patient vomited, urinated, or defecated since taking the poison? (Bring samples to the hospital.)

e. What have bystanders done for or to the patient--tried to induce vomiting, given an antidote, etc.?

4-5. THERAPEUTIC PROCEDURES FOR REMOVAL OF POISONS

Different poisons require different procedures for removal. Generally, however, begin by supporting the patient's vital functions. Maintain the airway and respiration, combat shock, and deal with specific medical problems as they arise. Next, administer an antidote if it is available and you are authorized to do so. Specific techniques for removal of poisons include the following:

a. **Removal by Emesis.** Using a good emetic drug (a drug that will induce vomiting) is the quickest and most effective way to evacuate the contents of the stomach. An additional advantage is that this method can be done immediately and at the site of the poisoning. Household emetics are rarely effective. Two methods of inducing vomiting are by syrup of ipecac taken orally and apomorphine hydrochloride administered subcutaneously.

(1) Syrup of ipecac. Many emergency room doctors recommend ipecac to induce vomiting when the patient has taken liquid poison. Give an adult patient one tablespoon of ipecac followed by 200 to 300 milliliters of water. For increased emetic action, give the patient up to a liter of warm water. Repeat the dose in twenty minutes and walk the patient. If there is no effect after the second dose, lavage (wash out) the stomach. For a patient under one year old, give 5 to 10 milliliters of ipecac. Do not give ipecac if the patient is drowsy, convulsive, or has ingested products containing acid, alkaline, or kerosene. Also, ipecac is not effective after the patient has been given activated charcoal. Do not give ipecac after the poison has been absorbed into the blood. Ipecac will not be helpful and may be harmful if the vomitus gets into the lungs.

(2) Apomorphine hydrochloride. When administered subcutaneously, this drug causes a patient to vomit in 5 to 10 minutes. A morphine derivative, apomorphine hydrochloride is potent and a prompt emetic. If the patient feels depressed after use of the drug, administer Narcan®. Drug dosage for an adult is 5 to 10 milligrams given once. **DO NOT REPEAT THE DOSAGE.** Do not use this drug for a patient in shock or under the influence of central depressants such as barbiturates, opiates, or alcohol. Such patients may become addicted to the drug. The possibility of addiction is also the reason the drug is administered only once to a patient suffering from poisoning.

CAUTIONS: Do NOT induce vomiting in an unconscious or convulsing patient. The danger is that the vomitus may be breathed into the lungs. Also, if the medullary center is depressed, agents that produce vomiting are not effective; the body's vomiting center will simply not work. The vomiting center will also not work if the central nervous system is depressed.

Do NOT use stomach tubes or emetics in cases of corrosive poisoning. Tubes or emetics will further irritate already irritated linings of the body's organs.

NEVER INDUCE VOMITING in these patients:

-- The stuporous or COMATOSE patient.
-- The patient with SEIZURES.
-- The PREGNANT patient.
-- The patient with possible ACUTE MYOCARDIAL INFARCTION.
-- The patient who has ingested CORROSIVES (strong acids or alkalis).
-- The patient who has ingested PETROLEUM PRODUCTS.
-- The patient who has ingested IODIDES, SILVER NITRATE (styptic pencil) or STRYCHNINE. (A person who has ingested strychnine may have convulsions if vomiting is induced.)

b. **Poison Removal by Absorption.** Activated charcoal can be used to absorb many poisons. Certain drugs such as morphine or atropine can be absorbed by activated charcoal. Do not use this substance to absorb cyanide. To use activated charcoal, mix 10 to 50 grams of activated charcoal in about 400 milliliters of warm water. Administer this liquid to the patient by gastric tube. The liquid will absorb or neutralize poisons. While the gastric tube is still inserted in the patient, lavage the patient. **DO NOT lavage if the patient has ingested corrosive poison.** Remember, **DO NOT give activated charcoal with or after ipecac;** charcoal causes ipecac to be ineffective.

c. **Poison Removal by Gastric Lavage.** Irrigating or washing out the stomach, gastric lavage, is a way to remove poisons. A stomach tube is inserted and large amounts of warm water are introduced slowly, usually 50 to 100 milliliters at a time. This procedure is normally done in hospital emergency rooms. To remove the stomach contents, insert a lubricated, soft but noncollapsible stomach tube through the patient's mouth or nose. Then, suction and save the contents of the stomach. Continue washing out the stomach with 50 to 100 milliliters of fluid until the fluid is clear. Always retain the contents for laboratory analysis.

CAUTIONS: DO NOT use a stomach tube when the patient has ingested acids, caustics, or ammonia. The stomach wall may be weakened, and a stomach tube being inserted could make a hole in that weakened wall.

DO NOT use a stomach tube if the patient has swallowed corrosive substances. There is a danger the patient will suck the corrosive substances in his lungs and do further damage.

DO NOT use a stomach tube if the patient has ingested strychnine. The attempt to pass a stomach tube may cause convulsions. In this case, the patient should have complete rest in a quiet room and gentle transport, if necessary.

d. **Poison Removal by Dilution.** The poison substance can be diluted or weakened giving the patient 200 milliliters of milk of magnesia (MOM), aluminum hydroxide gel, milk, or water. In addition to weakening the poison in the patient's body, these substances will soothe irritated skin or the mouth, stomach, or other sensitive membranes which have been exposed to a toxic or irritating agent.

e. **Removal of Poison by Demulcent.** A demulcent is a mucus-type fluid which serves to reduce irritation and soothes inflammation, especially on the mucous membranes of the body. Beaten egg whites and flour or starch paste are demulcents. When eaten, these substances can reduce irritation and soothe the irritation caused by swallowing poison.

f. **Poison Removal by Systemic Antidotes.** Some poisons may be removed by using systemic medications, that is, medicine which affects the whole body. If you are to use such medicine, the poison must be identified, and the specific antidote for that poison must be available. There are few systemic antidotes available in comparison to the number of substances which are poisonous to humans. Use the specific antidote to the ingested poison whenever possible. For example, use Narcan® (also called Naloene®) to reverse the action of all narcotic drugs such as heroin, morphine, methadone, codeine, and Darvon®. Use dimercaprol and calcium disodium to reverse the actions of arsenic. Administer tropine and pralidoxime to reverse resulting conditions of poisoning such as bradycardia.

g. **Removal of Poison by Elimination.** Poisons can be removed from the body through the process of elimination by these organs: kidneys, lungs, liver, gastrointestinal tract, skin, and salivary glands.

(1) Kidneys. One of the activities of the kidneys is to remove toxic wastes from the blood. Some poisons can be removed in this manner.

(2) Lungs. In the exchange of gases in the lungs, some poisons can be part of that exchange and eventually eliminated by being breathed out during the respiration cycle.

(3) Liver. Liver cells contain enzymes that either break down some poisons or transform such poisons into less harmful compounds. The compounds are eventually excreted by the kidneys and sweat glands.

(4) Gastrointestinal tract. Some poisons can be eliminated by expelling the contents of the stomach through the mouth by way of the gastrointestinal tract.

(5) Skin. Some poisons can be eliminated through the sweat glands of the skin.

(6) Salivary glands. Urea and uric acid are found in saliva because the saliva- producing glands help rid the body of wastes. Some poisons are eliminated by the salivary glands also.

h. **Poison Removal by Diuresis.** Poisons may be excreted from the system by the use of diuretics, medicines that increase the production of urine. The most damaging effects of poisons are found at the points of excretion; therefore, it is a good idea to eliminate poisons as quickly as possible from the body. If you do not know exactly about the urinary output of a specific poison, hydrate the patient enough to maintain a copious urine output. Be careful not to give the patient too much liquid otherwise his circulatory system may be overloaded.

i. **Removal of Poison by Cathartics.** Cathartics are drugs used to empty the bowel by speeding intestinal contents through the gastrointestinal tract faster than laxatives. Cathartic drugs increase the emptying of the bowels by increasing bulk of the content and speeding up the movement of muscle fibers which push contents through the intestines or colon.

CAUTION: DO NOT give magnesium citrate, a cathartic, if diarrhea is present.

j. **Poison Removal by Dialysis.** An extreme measure used to remove poisons from the body is peritoneal dialysis performed by a physician. Sterile dialyzing fluid is introduced into the abdominal cavity and used to wash poison out of that cavity. Hemodialysis, the process of passing blood through a semipermeable membrane which is in a bathing solution (artificial kidney) and then returning the blood to the body, is performed in a hospital and is also a method of removing poison from the body.

4-6. CHEMICAL POISONING

A variety of chemical agents can poison humans. Corrosives rapidly destroy or decompose body tissues wherever the chemical touches the body. Some metals irritate and poison the body. Salicylates, ethyl alcohol, methyl alcohol, and petroleum products also do chemical damage to the human body.

a. **Corrosives.** Corrosives are chemical substances which destroy or decompose body tissues at the point where the chemical touches the body. Hydrochloric acid, phenol, nitric acid, and sodium hydroxide (lye) are corrosive poisons. If an individual swallows this type of poison, he may destroy the lining of his mouth and throat. Damage to internal organs, especially organs of excretion such as the kidneys, is also possible.

(1) Signs/symptoms of corrosive poisoning. Included are the following:

(a) An immediate burning pain in the throat, mouth, and stomach followed by retching and vomiting.

(b) Stomach contents mixed with shreds of mucous membrane from the stomach, esophagus, and mouth.

(c) A characteristic stain inside the mouth and lips if an acid has been swallowed.

(d) Difficulty swallowing (dysphagia).

(e) Difficult or labored breathing (dyspnea).

(f) Tenderness and gas distention of the abdomen.

(g) Fever.

(2) Treatment for corrosive poisoning. Treat as follows:

(a) **DO NOT try to make the victim vomit.**

(b) Wash out the patient's mouth with water to dilute the acid and reduce its effect. Then, try to remove the poison by dilution as described in paragraph 4-5d of this lesson.

(c) To reduce further irritation and damage as well as soothe the irritated membranes, give the patient a demulcent. Use of demulcents is described in paragraph 4-5e of this lesson.

(d) Treat the patient for shock.

(e) Next, take the patient to a field medical treatment facility or evacuate as soon as possible. At the next facility, the acid will be further diluted, and the patient will be treated for burns.

b. **Metals.** Usually, the body tissues are not directly destroyed by metal poisoning. Instead, metal poisoning often sets up an inflammatory process at the site of application or contact with the metallic substance. Among the metals which can poison humans are ferrous sulfate (i.e., iron pills), mercury, bismuth, phosphorus (i.e., fireworks), and poisons for mice and rats. Most of the cases of poisoning from ferrous sulfate are the result of children eating too many candy-coated ferrous sulfate tablets (iron pills). The mortality rate is up to 30 percent. All forms of mercury are toxic if they are absorbed. Mercury fatalities taking place in the home usually come from fumes from gas heaters and from radiators painted with aluminum-looking (really mercury based) paint. Bismuth is a silver-white metal used in the manufacture of electric gases, low melting solders, and fusible alloys. Many rodenticides (poisons for mice and rats) contain metals which are harmful to humans if ingested. Lead poisoning is common among children nibbling on crib rails or toys which have been painted with old fashioned lead-based paint. Use of improperly glazed china and other ceramics can make people ill with lead poisoning.

(1) Signs/symptoms of metal poisoning. Included are the following:

(a) Nausea.

(b) Vomiting.

(c) Purging (evacuation of bowels).

(d) Blood in the vomited matter and stools.

(e) Inflamed urinary tract.

(f) Blue line around the gums.

(g) There may be pain and cramps in the abdomen.

(2) Treatment for metal poisoning. Included are the following:

(a) **DO NOT induce vomiting.**

(b) Use demulcents (gummy or oily substance that is soothing to irritated membranes) such as aluminum hydroxide gel, egg whites, milk, salad oil, vegetable or mineral oil (two ounces), flour in copious amounts of water, or diluted milk of magnesia (200 milliliters).

(c) When a specific antidote for a poison is not available, wash the stomach out by lavaging. A solution of activated charcoal freshly suspended in water should be used to wash out the stomach cavity.

c. **Salicylates.** Medications in this group have an alkaloid chemical component that is extremely harmful to the body within four hours after ingestion. Aspirin is a typical salicylate medication. Children between the ages of one and four have the highest mortality rate from this type of poisoning. Toxic dosage is usually more than 0.15 grams per kilogram weight of the patient.

(1) Signs/symptoms of salicylate poisoning. An individual suffering from a mild overdose of salicylates (less than 68 milligrams per pound of body weight) will have nausea, vomiting, and stomach irritation. A person who takes a single overdose in the range of 68 to 138 milligrams for every pound of body weight experiences rapid and deep breathing (hyperventilation), dizziness, ringing or buzzing in the ears (tinnitus), flushing, sweating, drowsiness, scant urine with a strong odor, diarrhea, and rapid heartbeat. Someone with a severe overdose in the range of 140 milligrams to 230 milligrams per pound of body weight can suffer fever, hemorrhage, overexcitement, convulsions, pulmonary edema, delirium, or respiratory failure. The patient may go into a coma a day or so after he shows changes in mental function and finally die.

(2) Treatment of salicylate poisoning.

(a) Induce vomiting by giving the patient syrup of ipecac if he is awake and alert. Then, wash out the stomach cavity by lavaging.

(b) Start an IV and force diuresis (an increased urine output) by administering a solution of water with five percent dextrose plus 30 milliequivalents of potassium chloride per liter intravenously. This will provide the proper amount of body fluids.

(c) Restore the alkaline level of the urine to its proper level by administering bicarbonate. Keep the urine alkaline level at a neutral 7.0.

(d) If the patient's body temperature is very high, cover him with a cooling blanket.

(e) Give Vitamin K or prothrombin to allow the blood to clot normally again.

d. **Ethel Alcohol.** Ethel alcohol is the alcohol we commonly drink. In sufficient quantities, it can be a poison.

(1) Signs/symptoms of ethyl alcohol poisoning. This type of poisoning can cause vomiting (sometimes with blood) and stomach pains, a drop in body temperature, confusion, and disorientation.

(2) Treatment of ethyl alcohol poisoning.

(a) Perform gastric lavage (washing out of the stomach by means of a gastric tube).

(b) Maintain the patient's airway.

(c) Keep the patient warm.

e. **Methyl Alcohol.** Methyl alcohol, sometimes called "wood alcohol," is a highly poisonous substance. As little as one teaspoonful can cause permanent blindness.

(1) Signs/symptoms of methyl alcohol poisoning. Symptoms do not begin to appear until a day after the methyl alcohol is ingested. Headache, dizziness, a feeling of ill health, severe stomach pains, nausea and vomiting, and loss of appetite occur. The patient experiences various visual difficulties, and a "drunken" appearance followed by weakness, convulsions, and coma.

(2) Treatment of methyl alcohol poisoning.

(a) If the person is alert and awake, administer syrup of ipecac to cause vomiting. **DO NOT cause vomiting if the person is drowsy or unconscious.** Repeat the dose of ipecac one more time if the patient does not vomit in 20 or 30 minutes.

(b) Give the patient a dose of activated charcoal after he has vomited.

(c) Offer other supportive measures as necessary.

f. **Petroleum.** Petroleum is found in products such as kerosene, lighter fluid, gasoline, furniture polish, and turpentine. Intratracheal toxicity is 100 times as great as oral toxicity. Aspiration of chemicals will almost certainly lead to pulmonary complications.

(1) Signs/symptoms of petroleum poisoning. Signs and symptoms are numerous and varied. Included are headache, vomiting, weak irregular pulse, and muscle twitching. The person has probably inhaled the petroleum product into the lungs if he has a persistent cough. Fever, fluid in the lungs, rapid or labored breathing, and a bluish tinge in the fingernails or lips also indicate that the person has inhaled petroleum product fumes into the lungs.

(2) Treatment for petroleum poisoning.

(a) Move the patient to fresh air.

(b) The use of gastric lavage (washing out the stomach by gastric tube) or emetics (substances to cause vomiting) is controversial because there is a danger the patient may suck some methyl into the lungs, causing more bodily harm by damaging the lungs. If gastric lavage is performed, be very careful to prevent aspiration. (Use a cuffed endotracheal tube.)

(c) After performing gastric lavage, give the patient magnesium cathartic to cause increased evacuation of the bowels.

(d) Remove ingested hydrocarbons only if the amount exceeds one milliliter per kilogram of body weight or if the hydrocarbons contain toxic solutes.

(e) For three to four days after ingesting methyl alcohol, watch the patient closely for symptoms of respiratory involvement.

(f) Treat pulmonary edema with oxygen (not to exceed 40 percent concentration). Use a rebreathing mask. **DO NOT use a high concentration mask.**

(g) Give antibiotics if fever occurs.

4-7. POISONING CAUSED BY VEGETATION

Although many varieties of plants can be poisonous to humans if ingested, a large percentage of poisonings by vegetation occur from eating poison mushrooms. One reason is that it is very difficult to distinguish poisonous mushrooms from nonpoisonous ones. Additionally, poisonous and nonpoisonous mushrooms always grow in the same area and look very much alike. Mycologists, mushroom experts, recognize eight different varieties of poisonous mushrooms, each group consisting of several different species. People gathering wild mushrooms are liable to collect and cook not only nonpoisonous mushrooms but also several varieties of poisonous mushrooms. Refer to table 4-1 for a list of plants, toxic parts, and specific poisoning symptoms.

PLANTS	TOXIC PART(S)	SYMPTOMS
FLOWER GARDEN PLANTS		
Lily–of–the–Valley	Leaves, flower	Irregular heart beat and pulse, usually accompanied by digestive upset and mental confusion.
Iris	Underground stems	Severe––not usually serious––digestive upset.
Foxglove	Leaves	Large amounts cause dangerously irregular heartbeat and pulse, usually digestive upset and mental confusion. May be fatal.
Bleeding Heart	Foliage, roots	May be poisonous in large amounts. Has proved fatal to cattle.
VEGETABLE GARDEN PLANTS		
Rhubarb	Leaf blade	Fatal. Large amounts of raw or cooked leaves can cause convulsions, coma, followed rapidly by death.
ORNAMENTAL PLANTS		
Daphne	Berries	Fatal. A few berries can kill a child.
Wisteria	Seeds, pods	Mild to severe digestive upset. Many children are poisoned by this plant.
Golden Chain	Bean–like capsules containing seeds	Severe poisoning. Excitement, staggering, convulsions and coma. May be fatal.
Laurels, Rhododendron, Azaleas	All parts	Fatal. Produces nausea and vomiting, depression, difficult breathing, prostration, and coma.
Jasmine	Berries	Fatal. Digestive upset and nervous symptoms.
Lantana Camara (Red Sage)	Green berries	Fatal. Affects lungs, kidneys, heart, and nervous system. Grows in southern US and in moderate climates.
Yew	Berries, foliage	Fatal. Foliage more toxic than berries. Death is usually sudden without warning symptoms.

Table 4-1. Poisonous vegetation (continued).

PLANTS	TOXIC PART(S)	SYMPTOMS
TREES AND SHRUBS		
Wild and cultivated cherries	Twigs, foliage	Fatal. Contains a compound that releases cyanide when eaten. Gasping, excitement, and prostration are common symptoms.
Oaks	Foliage, acorns	Affects kidneys gradually. Symptoms appear only after several days or weeks. Takes a large amount for poisoning.
Elderberry	All parts especially roots	Children have been poisoned by using pieces of the pithy stems for blowguns. Nausea and digestive upset.
Black Locust	Bark, sprouts, foliage	Children have suffered nausea, weakness, and depression after chewing the bark and seeds.
PLANTS IN WOODED AREA		
Jack–in–the–Pulpit	All parts, especially roots	Like Dumb Cane, contains small needle–like crystals of calcium oxalate that intensely irritate and burn the mouth and tongue.
Moonseed May be fatal.	Berries	Blue, purple color, resembling wild grapes.
Mayapple	Apple, foliage, roots	Contains at least 16 active toxic principles, mostly in the roots. Children often eat one apple with no ill effects; several apples may cause diarrhea.
PLANTS IN SWAMP OR MOIST AREAS		
Water Hemlock	All parts	Fatal. Violent and painful convulsions. A number of people have died from hemlock.
PLANTS IN FIELDS		
Buttercups	All parts	Juices may severely injure the digestive system.
Nightshade	All parts, especially the unripened berry.	Fatal. Intense digestive and nervous system disturbances.
Poison Hemlock	All parts	Fatal. Resembles a large wild carrots.
Jimson Weed (Thorn Apple)	All parts	Abnormal thirst, distorted sight, delirium, incoherence, and coma. Common cause of poisoning. Has proved fatal.

NOTE: Treat unknown plants with respects, and teach your children to do the same.

Table 4-1. Poisonous vegetation (concluded).

a. **Signs/Symptoms of Vegetation Poisoning.** Included are the following:

(1) Sudden onset, occurring within two hours of ingestion.

(2) Confusion.

(3) Excitement.

(4) Thirst.

(5) Nausea and vomiting.

(6) Diarrhea.

(7) Wheezing and salivation.

(8) Slow pulse.

(9) Small pupils.

(10) Tremors, weakness, collapse, and possibly death.

b. **Treatment of Vegetation Poisoning.**

(1) Cleanse the system by inducing vomiting, gastric lavage to wash the stomach cavity, and cathartic medication to evacuate the contents of the intestines.

(2) Atropine, a specific antidote to the effects of anticholinergic plants, may be given to reverse specific symptoms. The dosage is one to two milligrams subcutaneously repeated every 30 minutes as required.

(3) Administer barbiturates to stimulate the patient's system.

(4) Give fluids intravenously or orally.

(5) Treat the patient for shock.

(6) Check with your local poison control center for plant poisoning other than mushrooms. Bring a sample of the plant ingested to the hospital with the patient.

4-8. POISONING CAUSED BY FOOD

a. **Staphylococcal Food Poisoning.** Food poisoning usually occurs within three to six hours after the food has been consumed. The most common of all food poisoning in the United States is staphylococcal food poisoning. Coagulase-positive staphylococci can grow in foods such as milk, ice cream, cream-filled bakery goods, rapidly cured ham, and potato salad when these foods are left too long at room temperature. A person eats the food which contains staphylococcus enterotoxin, and that toxin enters the person's small intestine, and three to six hours later the person becomes ill very suddenly.

b. **Signs/Symptoms of Staphylococcal Food Poisoning.**

(1) The illness usually begins suddenly with nausea and vomiting. The person may also experience abdominal cramps, diarrhea, headache, and/or fever. Headache and sweating often occur when other symptoms are moderately severe. In very severe cases, the patient may become physically exhausted, and his blood pressure may fall.

(2) Symptoms of shock have been observed. If the patient is in shock due to loss of body fluids and electrolytes resulting in decreased blood circulation, administer a saline solution intravenously immediately. The amount of fluid given should be governed by the patient's age and the severity of the vomiting and diarrhea.

(3) When individuals rather than groups of people become ill with symptoms resembling those of staphyloccal food poisoning, it is important to eliminate other possible causes first, causes such as appendicitis or the onset of some infectious disease.

(4) There is no specific drug or serum for staphylococcal therapy. Fatal cases usually involve the very young, the very old, or the debilitated patient.

4-9. POISON CONTROL CENTERS AND REFERENCES

a. **Poison Control Centers.** Poison Control Centers in the United States were first organized in 1953, the first center being in Chicago. The purpose was to form a network for sharing information learned about how to treat poisonings. These centers come under the U.S. Public Health Service and today are a clearing house for poison information. The chief purpose is to exchange information with the many local control centers which exist through the country. Major medical centers have these poison control centers. Poison control centers are located in major medical centers and operate on a 24-hour basis. Each medical facility should try to use the services of the nearest center. Become familiar with the center nearest you because it will probably be your most valuable resource.

b. **References.** Do become familiar with good references on poisonings and their treatments. The reason is that all references do not provide the same type of information, and you need to have an idea of where to look for the answer to specific questions. These are the references that are most commonly used:

(1) The Physicians' Desk Reference-- contains product information, manufacturer's index, and product information.

(2) The Merck Index--contains either the generic or the trade name and the chemical name cross indexed of foreign and American products.

(3) The Handbook of Poisoning-- organized by settings (agricultural, household, plant, and insect). Discusses poison prevention, emergency treatment, and diagnosis.

(4) The Clinical Toxicology of Commercial Products--comprehensive book that discusses poisoning signs, symptoms, and treatment.

4-10. CLOSING

Poisoning may be accidental, or purposeful, as in a suicide attempt. Either way, prompt recognition and appropriate treatment are necessary and should begin as soon as possible. This lesson was designed to familiarize the Medical NCO with some broad categories of signs and symptoms that may occur and general and specific treatments and guidelines to follow when an ingested poisoning is suspected. Remember the importance of the basic steps of management and utilize the poison control center for more specific advice.

Continue with Exercises

EXERCISES, LESSON 4

INSTRUCTIONS. Answer the following exercises by writing the answer in the space provided.

After you have completed all of these exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. What is an ingested poison? _____

   _____

2. Define acute poisoning. _____

   _____.

3. List three methods of removing poisons from the body.

   a. _____.

   b. _____.

   c. _____.

4. The patient is awake and alert and must be treated for salicylate poisoning.

   Induce vomiting by _____.

5. _____ food poisoning is the most common type of food poisoning in the United States.

6. Two good reference books on poisonings and their treatments are _____

   and _____.

7. The quickest and most effective way to evacuate the contents of the stomach is

   _____.

8. Another method of removing poison from the body is to administer apomorphine hydrochloride subcutaneously. This causes _____

_____

9. List four situations in which you would NOT induce vomiting.

   a. _____.

   b. _____.

   c. _____.

   d. _____.

10. Beaten egg whites, flour, and starch paste are all _____, substances which can reduce and soothe the irritated membranes of a person who has swallowed poison.

11. List the parts of the body which act to remove poison through elimination.

   a. _____.

   b. _____.

   c. _____.

   d. _____.

   e. _____.

   f. _____.

12. Give the reason a stomach tube should not be used if the patient has swallowed acids._____

_____.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 4

1. An ingested poison is a substance which may cause serious illness or death when introduced into the body. (para 4-1b)

2. Acute poisoning is the condition brought on by taking an overdose of poison at one time. (para 4-1b)

3. You are correct if you listed any three of the following ways to remove poison from the body:

   Give Syrup of Ipecac.
   Administer Apomorphine Hydrochloride.
   Absorption.
   Gastric lavage.
   Dilution.
   Demulcent.
   Give a specific systemic antidote.
   Elimination.
   Diuresis.
   Give a cathartic.
   Dialysis. (para 4-5a through j)

4. Giving him Syrup of Ipecac. (para 4-6c(2))

5. Staphylococcal. (para 4-8a)

6. You are correct if you listed any two of the following:

   The Physicians' Desk Reference.
   The Merck Index.
   The Handbook of Poisoning.
   The Clinical Toxicology of Commerical Products. (para 4-9b)

7. To give a good emetic drug so that the patient will vomit. (para 4-5a)

8. The patient to vomit in five to ten minutes. (para 4-5a(2))

9. You are correct if you listed any four of the following:

   Stuporous or comatose patient.
   Patient with seizures.
   Pregnant patient.
   Patient with possible acute myocardial infarction.
   Patient has ingested corrosives.
   Patient has ingested petroleum products.
   Patient has ingested iodides, styptic pencil, or strychnine. (para 4-5a(2))

10. Demulcents. (para 4-5e)

11. List the following in any order:

    Kidneys.
    Lungs.
    Liver.
    Gastrointestinal tract.
    Skin.
    Salivary glands. (para 4-5g)

12. The stomach wall may be weakened, and a tube being inserted into the stomach could make a hole in that weakened part of the wall.
    (para 4-5c, CAUTION)

End of Lesson 4

LESSON ASSIGNMENT

LESSON 5	Nasogastric Intubation.
LESSON ASSIGNMENT	Paragraphs 5-1 through 5-22.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

5-1. Identify the purposes and indications of nasogastric intubation.

5-2. Identify the indications/contraindications for nasogastric intubation.

5-3. Identify the complications associated with nasogastric intubation.

5-4. Identify different types of nasogastric tubes.

5-5. List the procedural steps for nasogastric intubation in the proper sequence.

SUGGESTION After completing the assignment, complete the exercises of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 5

NASOGASTRIC INTUBATION

Section I. PRELIMINARY STEPS

5-1. INTRODUCTION

According to the latest statistics, gastrointestinal disorders are the most common ailments treated at medical facilities. To deal with this type of disorder, it is sometimes necessary to insert a tube into the patient's stomach or intestine. The term gastrointestinal intubation means that a specified tube is inserted through the patient's nose or throat into his stomach or intestine. Gastrointestinal intubation is a fairly common procedure. The reasons for its use are as follows:

a. To drain the stomach or intestinal tract by means of some kind of suction apparatus. Gastrointestinal intubation is used to prevent postoperative vomiting, to prevent postoperative obstruction of the intestinal tract, and to prevent the stomach or intestine from being stretched by fluid or gas.

b. For diagnosis, to identify a disease or the cause of a pathological condition.

c. To wash out the stomach contents; for example, after taking poison.

d. To provide a route for feeding a person who is unable to take food by mouth.

5-2. INDICATIONS/CONTRAINDICATIONS TO USE NASOGASTRIC INTUBATION

a. **Indications to Use Nasogastric Intubation.** Use nasogastric intubation--passing the gastric tube through the nose and into the stomach and intestines--when the following conditions exist:

(1) It is known or suspected that the patient has ingested poisonous or caustic (something which can burn or destroy living tissue) substances.

(2) There is a need to increase the patient's nutritional intake.

(3) The individual is a burn patient with more than 30 percent total body surface involved. In such a case, there is high incidence of duodenal stress ulcer and also a high rate of paralytic ileus (obstruction of the intestines caused by paralysis of the intestinal walls).

(4) The patient's abdomen is distended (stretched).

(5) Persistent vomiting is suffered by the patient.

(6) Auscultation reveals decreased or absent bowel sounds.

b. **Contraindications to Use Nasogastric Intubation.** DO NOT use nasogastric intubation in the following circumstances:

(1) Facial fractures with suspected cribriform plate injuries.

(2) Esophageal strictures or a history of alkali ingestion. Intubation would increase the possibility of esophageal perforation.

(3) Comatose patients with unprotected airway. Nasogastric intubation increases the risk of aspiration.

(4) Penetrating cervical wounds in a conscious trauma patient. The gagging efforts could stimulate hemorrhage.

5-3. COMPLICATIONS DUE TO USE OF NASOGASTRIC INTUBATION

There are some complications associated with using a nasogastric tube. The nasopharynx and other related upper airway structures may suffer injury or damage. The esophagus and stomach may be injured. The tube may be accidentally inserted through the trachea causing oxygen deficiency. If the tube remains in place for a long time, the following conditions may occur:

a. Nasal erosion--irritation and gradual wearing away of the membranes lining the nose, the condition being caused by the presence and rubbing of the nasogastric tube.

b. Sinusitis--the inflammation of the mucous membrane of a sinus, particularly a paranasal sinus.

c. Esophagitis--inflammation of the esophagus.

d. Gastric ulceration--ulcers of the stomach, usually on or near the smallest curve of the stomach.

e. Pulmonary infection--infection of the lungs.

f. Other respiratory tract infections-- pneumonia from the tube being placed into the patient's right lower lobe bronchus; hydropneumothorax (collection of fluid and gas within the pleural cavity) caused by the tube being placed in the bronchial airways.

g. Gastrointestinal bleeding--caused by the tube damaging gastrointestinal lining.

5-4. TYPES OF NASOGASTRIC TUBES

The first nasogastric tubes were made of soft rubber. Recently, tubes have been made of silastic and polyethylene compounds. These tubes can be inserted more easily and also cause fewer medical problems for the patient. There are fewer instances of inflamed tissues. With the exception of this change, nasogastric tubes are very much the same today as they have been for the last three decades. The most commonly used nasogastric tube is the Levin tube. Other nasogastric tubes include the Salem-sump tube, the Miller-Abbott tube, and the Cantor tube.

a. **The Levin Tube.** The actual tubing is referred to as lumen. The Levin tube is a one-lumen nasogastric tube. The Salem-sump nasogastric tube is a two-lumen piece of equipment; that is, it has two tubes. The Levin tube is usually made of plastic with several drainage holes near the gastric end of the tube. There are graduated markings on the lumen so that you can see how far you have inserted the tube into the patient. This nasogastric tube is useful in instilling material into the stomach or suctioning material out of the stomach.

b. **The Salem-Sump Tube.** This nasogastric tube is a two-lumen piece of equipment. It has a drainage lumen and a smaller secondary tube that is open to the atmosphere. The major advantage of this two-lumen tube is that it can be used for continuous suction. The continuous airflow reduces the frequency of stomach contents being drawn up into the whole of the lumen which is in the patient's stomach.

c. **The Miller-Abbott Tube.** This tube is also a two-lumen nasogastric tube. There is a rubber balloon at the tip of one tube; the other tube has holes near its tip. After one tube has passed through the pylorus (the opening between the stomach and the duodenum), the balloon is inflated with air. The balloon is then moved along the intestinal tract by peristalsis (movement by alternate contraction and relaxation, in the case, of the intestinal walls. The rest of the tube is propelled along with the balloon. The contents of the intestines are sucked back through the holes in the tube. The Miller-Abbott nasogastric tube has two separate openings. The end of the tube which is outside the patient's body has a metal adapter with two openings. One opening is for suction and is marked "suction." The other opening is used by a doctor to inflate the balloon. Be sure this last opening is marked so that no one becomes confused and connects the opening to a suction device or instills irrigating solutions through that opening.

d. **The Cantor Tube.** This nasogastric tube has one lumen and a bag on the end. Mercury is inserted into the bag, and the mercury helps move the tube along the intestinal tract. Before the tube is inserted into the patient, mercury is injected directly into the bag with needle and syringe. The needle makes an opening large enough for the mercury to go through but not large enough for the mercury to leak out. When the tube is inserted into the patient, the bag holding the mercury becomes long. The Cantor tube is very effective when used for intestinal decompression (relief of stretching of the intestine through suctioning out intestinal contents).

Section II. PROCEDURE FOR INSERTING THE NASOGASTRIC TUBE

5-5. CHECK THE DOCTOR'S ORDER

Before performing a nasogastric intubation, check the doctor's order to be certain the doctor has ordered this procedure. Inserting a nasogastric tube is NOT a routine procedure.

5-6. GATHER THE EQUIPMENT

To perform a nasogastric intubation, you will need the following equipment:

a. Nasogastric tube. The Levin tube is usually selected. Remember, the larger the number of the tube, the larger the size of the tube.

b. Water-soluble lubricant.

c. 500 cc bulb syringe.

d. Emesis basin; glass of water.

e. Suctioning apparatus.

f. Clean towel; sterile gloves; table.

g. Mayo stand and tray; adhesive tape.

h. Container for contaminated waste.

5-7. EXPLAIN THE PROCEDURE TO THE PATIENT

a. **General Information.** Explain the procedure to the patient to help relieve his fears and aid him in relaxing. The patient may be in pain or frightened. You need to explain the purpose of passing the tube into his body: to relieve distention of the stomach caused by gas, bleeding, or lack of peristalsis; to prepare for gastric studies; or as a means of feeding. Explain that the passage of the tube is painless but that it may cause gagging as it passes down the back of the throat. The gagging impulse passes quickly as the patient swallows. Swallowing helps to advance the tube.

b. **Specific Information.** Tell the patient that you will insert the tube along his nasal passage. Next, you will give him a cup of water with a straw. He is to drink through the straw when asked to do so, continuing to drink until asked to stop. Ask the patient if he has any history of nasal injury or deviated septum. Tell the patient that the tube must be placed about 20 inches down the nasogastric passage.

5-8. POSITION THE PATIENT

a. **Responsive Patient.** If the patient is responsive and needs to be positioned in the semi-Fowler's position, you should elevate the head of the bed to about a 45 degree angle. Then raise the knee latch or the foot of the bed so that the patient's knees are flexed at about a 15 degree angle.

b. **Unresponsive Patient/Lateral Position.** The patient is unresponsive and needs to be placed in the lateral position. Turn him onto his side. See that the head, neck, and back are in a straight line. Be sure the patient's legs are parallel with his knees slightly flexed. You may place his arm in a flexed position across his abdomen or so that it is supported on his body and hip.

c. **Ambulatory Patient.** Seat this patient on a chair. Have him tilt his head backward with his chin upward at about a five degree angle. Ask the patient to breathe through his mouth.

5-9. WASH YOUR HANDS

As with other medical procedures, wash your hands before you actually begin inserting the tube. Wash your hands according to local unit procedure.

5-10. PREPARE THE TAPE AND TUBING

Follow this procedure:

a. Cut four or five pieces of tape three to four inches long. Attach one end of each piece of tape to a surface where the tapes will be easily accessible.

b. Unwrap the tube from the plastic container. Peel open the wrapper and throw it away in the contaminated waste.

5-11. MEASURE THE TUBE PRIOR TO INSERTION

Use the tube to determine how far to insert the tube in the patient. Using the tube, measure the distance from the patient's earlobe to the tip of his nose. Then, measure and add the distance between the earlobe and the tip of the xiphoid process. This is roughly the distance from the patient's mouth to his stomach. Mark this distance on the tube with tape.

5-12. LUBRICATE THE TUBE WITH WATER-SOLUBLE LUBRICANT

After you have measured and marked the tube, lubricate three to four inches of the tube's end with a water-soluble lubricant. To do this, hold the tube tip with the thumb and fore-finger of your dominant hand. Bring the tip to the opening of the selected nostril. This lubrication permits the tube to be inserted easily.

5-13. TELL THE PATIENT TO DRINK WATER

Place the emesis basin under the patient's chin if the patient begins to gag. Keep a towel readily available to clean and dry the patient if he spills the water.

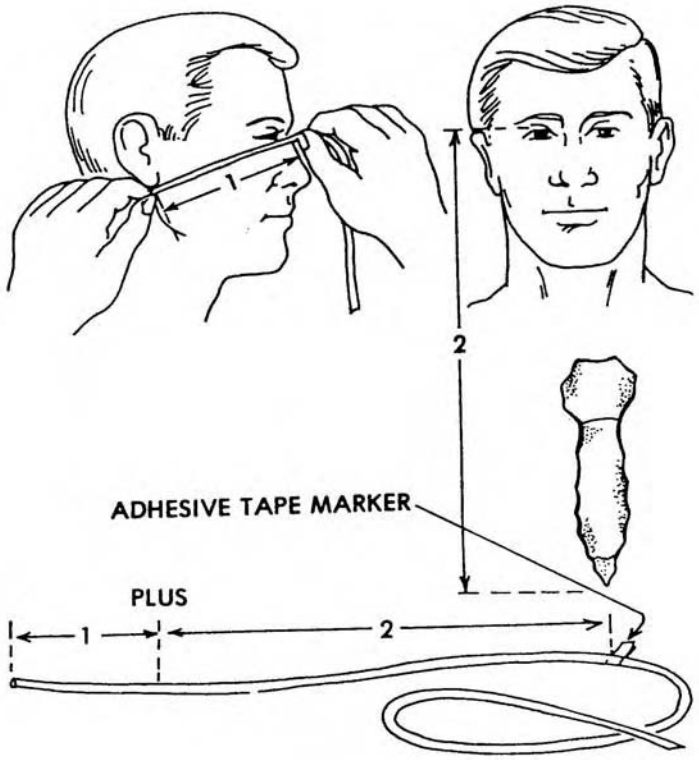


Figure 5-1. Determine the distance to insert the tube.

5-14. INSERT THE TUBE

Follow this procedure:

a. Slide the tube into the selected nostril when the patient swallows. Do this using the thumb and forefinger of each hand consecutively or concurrently, as you prefer.

b. Move the tube one to two inches forward into the nasogastric passageway each time the patient swallows. **DO NOT FORCE the advancement of the tube because it would cause the patient to gag, choke, or vomit.**

c. Discontinue the insertion if the patient chokes or coughs by removing the tube completely and/or allowing the patient to rest two to three minutes. Begin the procedure again.

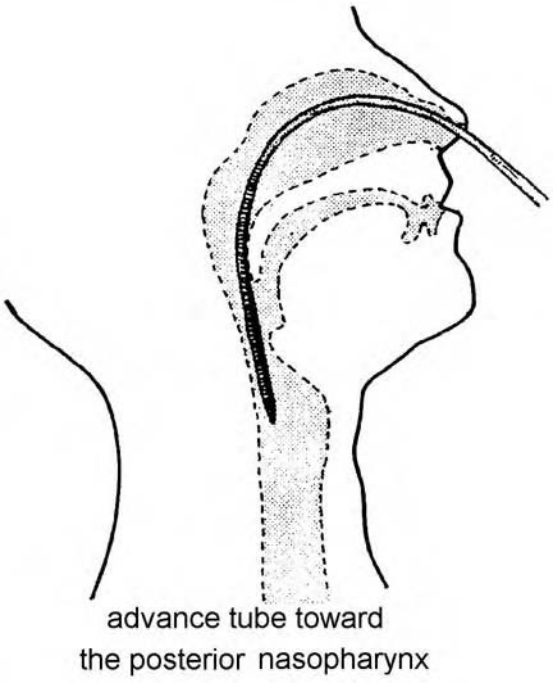


Figure 5-2. Inserting the nasogastric tube.

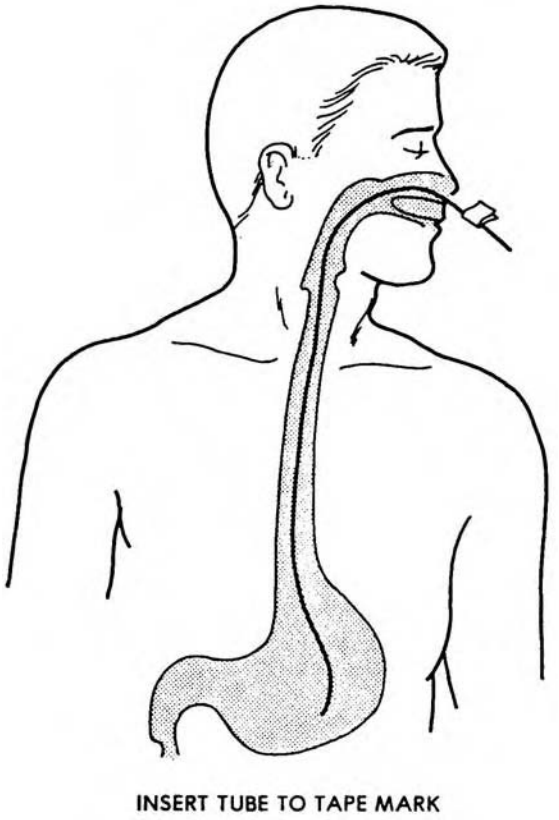


Figure 5-3. Nasogastric tube in place.

d. Look inside the patient's mouth with a flashlight to see if the tube is coiled in the throat. If it is, withdraw the tube until it is straight. Reassure the patient and allow him to rest a few moments before you continue.

e. Discontinue the procedure completely and refer the case to the doctor if the patient chokes, coughs a second time, or gags excessively.

f. Insert the tube to the tape mark. About 20 to 30 inches of the tube will be in the patient.

5-15. CHECK TUBE PLACEMENT

It is important to be sure that the nasogastric tube is in the correct place--the patient's stomach. There are three methods by which you can verify that the tube has actually reached the patient's stomach: check by aspiration; check by the patient's vocal response; and check by auscultation.

a. **Check by Aspiration.** Squeeze the bulb of a large syringe to get rid of all the air in the syringe, then fit the syringe into the near end of the nasogastric tube. Squeeze the bulb, release the bulb, and check the barrel of the syringe for gastric content. If the gastric contents are found in the barrel of the syringe, it indicates that the nasogastric tube is properly inserted and is in the patient's stomach.

b. **Check by Patient's Vocal Response.** Ask the patient to talk or hum. If he is unable to do so, remove the tube and try again. The tube is probably between the vocal cords and the trachea. If the patient can talk or hum, you know that the nasogastric tube is not in the larynx.

c. **Check by Auscultation.** Auscultation is the act of listening for sounds within the body with the use of a stethoscope. For this check, squeeze the bulb to void air from the syringe and prevent air from being injected into the stomach. Fit the syringe into the near end of the nasogastric tube. Place the diaphragm end of the stethoscope to the patient's stomach about two inches below the sternum. Squeeze the bulb of the syringe to inject air into the nasogastric tube. Listen for gurgling sounds; these sounds indicate that the nasogastric tube is properly placed. Move the diaphragm of the stethoscope to the front part of the lung area. Squeeze the syringe bulb again and listen for gurgling sounds. If you hear gurgling sounds in the lung area, withdraw the nasogastric tube immediately. Sounds in that area indicate that the tube is not in the correct position. Begin again to place the nasogastric tube properly.

CAUTION: If the patient becomes cyanotic or has difficulty breathing, REMOVE THE TUBE IMMEDIATELY. The tube is probably in the trachea.

5-16. TAPE THE TUBE TO THE PATIENT'S NOSE

Center the length of the tape under the nasogastric tube; the adhesive side of the tape should be up. Cross the ends of the adhesive over the top of the tube. Press down to secure the tape to the skin. Finally, connect the tube to the suction apparatus, if ordered. (The doctor may order continuous or intermittent (off-and-on) suction.)

5-17. PROVIDE FOR THE PATIENT'S COMFORT

A patient who requires nasogastric intubation is often quite ill and apprehensive. For that reason, the patient's environment must be kept quite, clean, tidy, and well-ventilated. Remove any soiled linen or equipment. Adjust the patient's pillows and bedding for comfort and neatness. Place the bed in a low position. Raise the siderails if used and place the call bell in easy reach.

5-18. REPORT AND RECORD THE PROCEDURE

Note the completion of the treatment with a description of the stomach contents. Record other information as necessary in accordance with local unit procedure.

5-19. PROVIDE HYGIENE CARE

Help the patient maintain good personal hygiene. The teeth should be brushed three or four times a day to stimulate the flow of saliva, to keep the mouth moist and clean, and to prevent parotitis (inflammation of the parotid gland). Change the position of the nasogastric tube from one side of the nose to the other and be sure to lubricate the intubated nostril. Changing tube placement and lubricating the nostrils help prevent either side of the nose from becoming sore, tender, and/or cracked. Change the adhesive tape whenever necessary. Finally, provide reassurance to the patient.

Section III. PROCEDURE FOR REMOVING THE NASOGASTRIC TUBE

5-20. PEEL OFF THE TAPE FROM THE NOSE AND NOSTRIL

This is the procedure to follow:

a. Approach and identify the patient. Explain what you are going to do. For example, "The tube is being disconnected because you are doing so well."

b. Wash your hands.

c. Turn the patient's head away from you in case the patient vomits. Be prepared by having an emesis basin near to give to the patient. Place the basin under his chin to catch vomitus, if necessary.

d. Untape the tube from the patient. Take care not to cause injury or discomfort to the patient. Place the adhesive strips in the container for contaminated waste.

5-21. REMOVE THE NASOGASTRIC TUBE

Follow this procedure:

a. Don sterile gloves.

b. Pull the tube horizontally out of the nostril until the tube is completely out. Use a slow, gradual, continuous motion and talk quietly to the patient as you pull the tube out. If the patient vomits, stop the removal of the nasogastric tube immediately. Hand the patient an emesis basin or place the basin under the patient's chin. Hand the patient a clean towel or wipe his chin and face with the towel. Continue the procedure of removing the tube when the patient is ready.

c. Place the soiled equipment (the tube) in the container for contaminated waste.

d. Clean the Mayo stand and tray with a germicidal agent before this equipment is reused.

e. Remove the gloves you are wearing and discard them in a container for contaminated waste.

f. Place the disposable towel into a container for contaminated waste. Place the cloth towel in a container for contaminated linen.

5-22. CLOSING

The more you practice this procedure, the easier it becomes. Consider your patient's comfort while performing nasogastric intubation. Remember, even the most skilled health care providers will have difficulty if a patient has an anatomical abnormality.

Continue with Exercises

EXERCISES, LESSON 5

INSTRUCTIONS. Answer the following exercises by writing the answer in the space provided.

After you have completed all of these exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. List three reasons why nasogastric intubation would be prescribed for a patient.

   a. _____.

   b. _____.

   c. _____.

2. Nasogastric intubation is used when the patient has a/an _____ stomach, _____ vomiting, or is suspected of ingesting poisonous or _____ substances.

3. List three complications that can be caused by prolonged nasogastric intubation.

   a. _____.

   b. _____.

   c. _____.

4. Before performing a nasogastric intubation, check _____ to be sure the procedures should be performed.

5. List five pieces of equipment that you should gather before you begin intubating the patient.

   a. _____.

   b. _____.

   c. _____.

   d. _____.

   e. _____.

6. Write three statements you should tell the patient before you begin nasogastric intubation.

   a. _____.

   b. _____.

   c. _____.

7. The patient is ambulatory; therefore, begin positioning him correctly for nasogastric intubation by _____. Have the patient tilt his head _____ with the chin upward at approximately five degrees. Ask the patient to breathe through his _____.

8. List the three steps necessary to measure the nasogastric tube before inserting the tube.

   a. _____.

   b. _____.

   c. _____.

9. If the patient chokes or coughs when you are inserting the nasogastric tube, you should _____.

10. When intubating the patient, how far do you insert the tube? Insert the tube _____

11. List three ways to check for correct placement of the nasogastric tube.

    a. _____.

    b. _____.

    c. _____.

12. When you are removing the nasogastric tube, pull the tube out of the nostril _____, using a slow, gradual, and continuous motion.

13. Be sure to put contaminated waste such as used adhesive strips _____ _____.

14. When you have finished removing the nasogastric tube from the patient, remove the gloves you are wearing and _____.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 5

1. You are correct if you listed any three of the following:

   Known or suspected that person has ingested poisonous or caustic substance(s).
   Need to increase person's nutritional intake.
   Burn patient with more than 30 percent of total body surface involved.
   Person's abdomen is stretched.
   Person suffering from persistent vomiting.
   Auscultation reveals decreased or absent bowel sounds. (para 5-2a)

2. Distended.
   Persistent.
   Caustic. (para 5-2a(1), (5), and (6).

3. You are correct if you listed any three of the following:

   Nasal erosion.
   Sinusitis.
   Esophagitis.
   Gastric ulceration.
   Pulmonary infection.
   Other respiratory tract infections such as pneumonia.
   Gastrointestinal bleeding. (para 5-3a thru g)

4. The doctor's orders. (para 5-5)

5. You are correct if you listed any five of the following:

   Nasogastric tube.
   Water soluble lubricant.
   500 cc bulb syringe.
   Emesis basin.
   Adhesive tape.
   Glass of water.
   Suctioning apparatus.
   Clean towel.
   Sterile gloves.
   Table.
   Mayo stand and tray.
   Container for contaminated waste. (para 5-6)

6. You are correct if you listed any three of the following statements which you could tell the person:

   You will insert the tube along his nasal passage.
   You will give him a cup of water with a straw.
   He is to drink through the straw when asked to do so and continue until told to stop.
   . The tube will be placed about 20 inches down his gasogastric passage.
   (para 5-7b)

7. Seating him on a chair.
   Backward.
   Mouth. (para 5-8c)

8. Measure the distance between the patient's earlobe and the tip of his nose.
   Add the distance between the earlobe and the tip of the xiphoid process.
   Mark the total distance on the tube with tape. (para 5-11)

9. Remove the tube completely; allow the patient to rest two to three minutes; then, begin the procedure again. (para 5-14)

10. To the tape mark. (para 5-14)

11. Check by aspiration.
    Check by the patient's vocal response.
    Check by auscultation. (para 5-15)

12. Horizontally. (para 5-21)

13. In the container for contaminated waste. (para 5-21)

14. Discard them in the container for contaminated waste. (para 5-21)

End of Lesson 5

LESSON ASSIGNMENT

LESSON 6	Abdominal Trauma.
TEST ASSIGNMENT	Paragraphs 6-1 through 6-6.
LESSON OBJECTIVES	After completing this lesson, you should be able to:
	6-1. Identify causes and mechanisms of abdominal injuries.
	6-2. Identify signs/symptoms of abdominal injuries.
	6-3. Identify treatment for abdominal injuries.
SUGGESTION	After completing the assignment, complete the exercises of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 6

ABDOMINAL TRAUMA

6-1. INTRODUCTION

Injuries to the abdomen are of concern to individuals who are involved with acute medical care. Many penetrating abdominal wounds are seen in combat. Surgical treatment is often necessary. Prompt initial therapy is the key to survival.

6-2. CAUSES AND MECHANISMS OF ABDOMINAL INJURIES

Automobile accidents, gunshot wounds, and stabbings to the abdomen are the most common causes of abdominal trauma. Automobile accidents are a common cause of abdominal injuries and trauma. The reason is that the seat belt is normally fastened across the abdomen resulting in seat belt trauma. Gunshot wounds to the abdomen also cause abdominal trauma. In the civilian sector, such wounds usually occur at low speed. In the military, gunshot wounds usually occur with high speed causing tissue to be destroyed. Gunshot wounds are more common in the military than stab wounds. In the civilian community, the reverse is true with stabbings to the abdomen being more common then gunshot wounds to the abdomen. Stab wounds can be very deceiving in that they may be more serious than they look. A small hole from an ice pick or screwdriver can hide a rupture of the spleen, for example.

a. **Most Commonly Ruptured Organs.** The spleen, the liver, the intestines, and the kidneys are the most commonly ruptured organs. The spleen is the organ which ruptures most frequently in blunt trauma. The liver ruptures frequently in penetrating trauma despite the protection of the rib cage. The size, weight, and location of the liver makes this organ highly susceptible to injuries. Injury to the intestines may be difficult to diagnose. Such injury sometimes goes undetected for days. The most common sign of intestinal injury is local tenderness. The casualty may eat and have normal bowel movements for a week before fever or infection begins. The kidneys bruise easily.

b. **Hemorrhaging Vessels.** Two major vessels are likely to hemorrhage if there is abdominal trauma. These vessels are the abdominal aorta and the inferior vena cava. An individual with abdominal hemorrhaging, who vomits and strains will increase the hemorrhaging.

NOTE: Body cavities are spaces in the body containing internal organs. The abdominal cavity contains the stomach, spleen, liver, gallbladder, pancreas, small intestine, most of the large intestine, the kidneys, and the ureters.

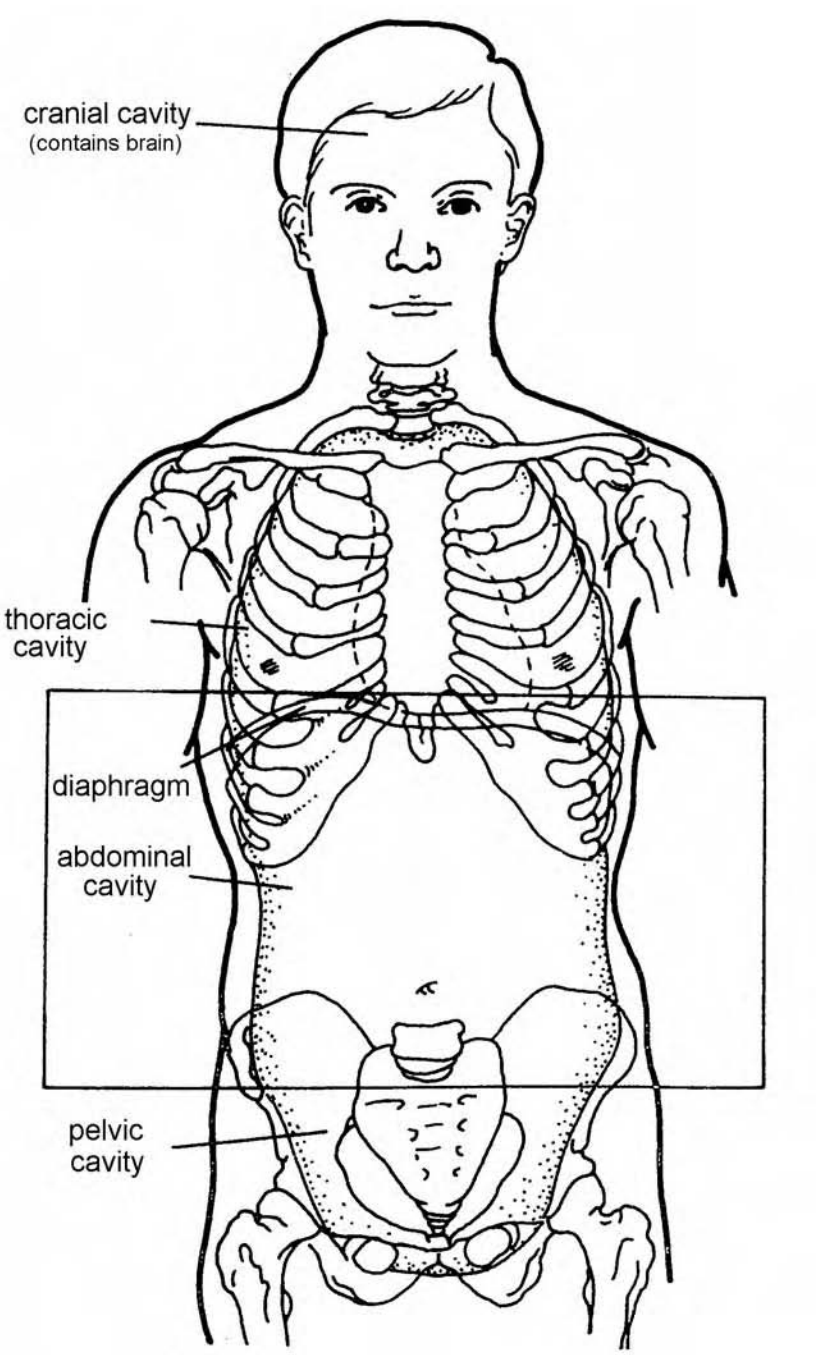
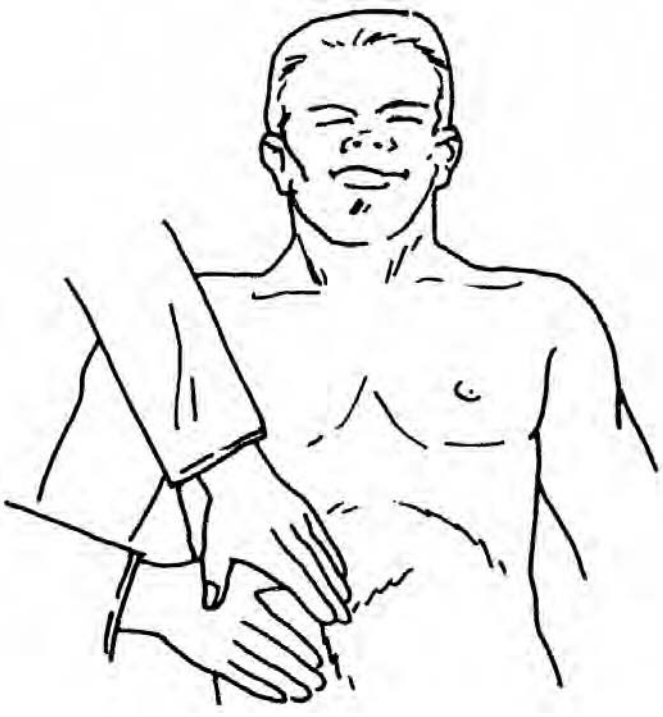


Figure 6-1. Abdominal cavity and other body cavities.

6-3. SIGNS/SYMPTOMS OF ABDOMINAL INJURIES

a. **Evaluate Nature/Extent of Abdominal Injuries.** Determine if the casualty has pain, is nauseated, or is vomiting. Ask questions if the casualty is able to respond. Check the casualty for wounds, bruises, old scars, and abrasions. Listen to each quadrant of the abdomen with a stethoscope. Palpate the abdomen making sure you carefully palpate the area of pain last.



Figures 6-2. Palpate the abdomen (continued).

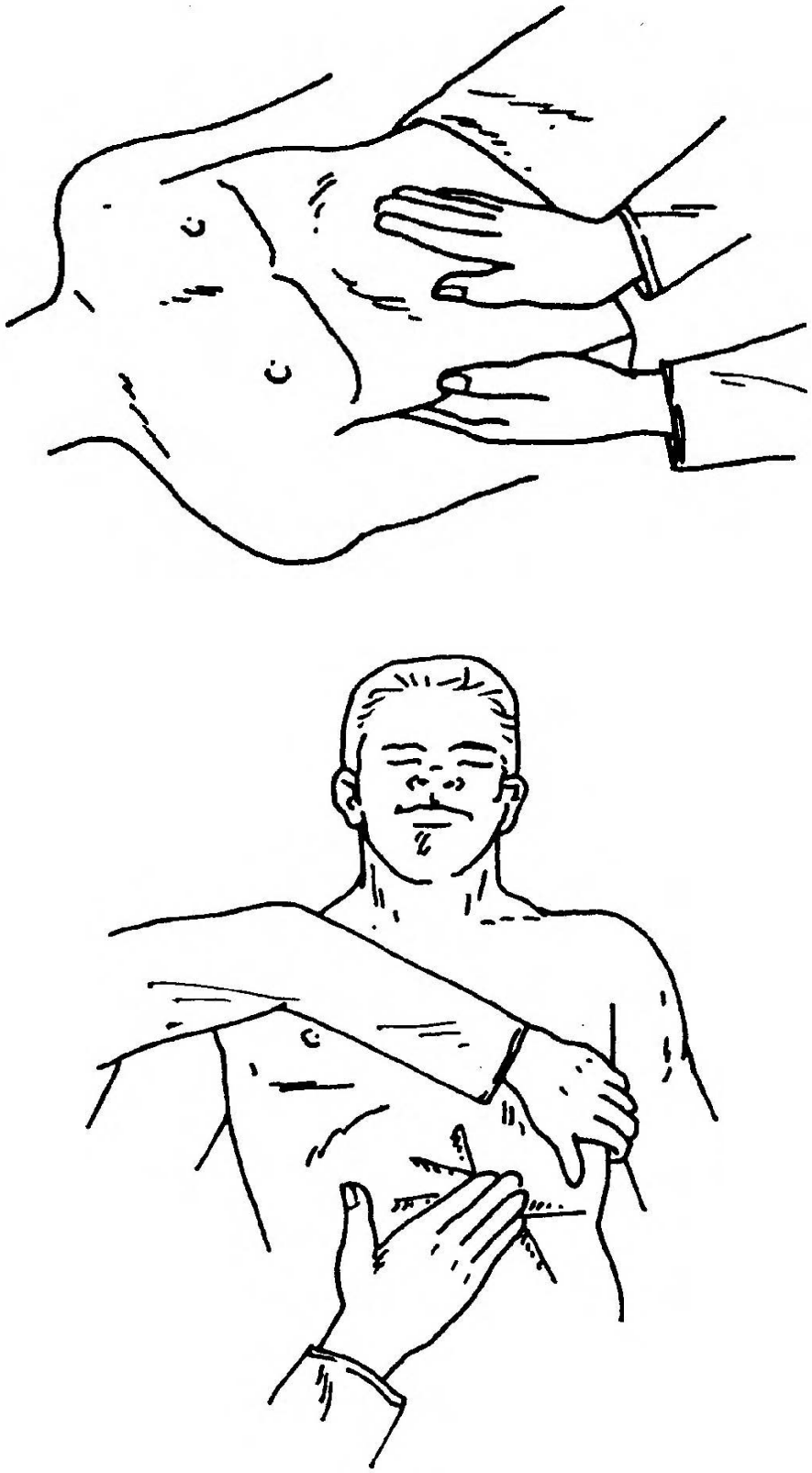


Figure 6-2. Palpate the abdomen (concluded).

b. **Signs/Symptoms of Abdominal Injuries.** Included are the following:

(1) Localized or generalized pain.

(2) Blood in emesis (vomit).

(3) Abdomen rigid when palpated. This critical sign, rigidity, is caused by muscle spasms in the abdominal body wall.

(4) Pain caused by light pressure (tenderness).

(5) Signs of shock when there is no apparent hemorrhage. There is often internal bleeding which was caused by the blow of a blunt object.

(6) Distention (swelling), a late sign.

(7) Pain referred up either shoulder.

(8) Extravasation (escape of fluid) of urine or blood under the skin.

(9) Jaundice.

(10) Unusual masses (hernia). You may feel a tumor or intestinal obstruction if the mass is large. The exact location should be recorded for the doctor.

(11) Lack of bowel sounds. By itself, this is not significant.

NOTE: Abdominal tenderness, guarding, and rigidity, on palpation are probably the most frequent and reliable findings of abdominal injury.

c. **Significant Findings of Abdominal Injury Evaluation.** If there are missile wounds in the abdominal walls, note the position of the casualty at the time of impact. This will help you determine the extent of damage due to missile trajectory. High velocity missiles can cause extensive internal damage to the human body. Bullets can tumble around organs and bounce off bones. Wounds of the chest or buttocks can also cause abdominal injury. The soldier may experience diaphragmatic rupture, the diaphragm reaching just below the nipples. If the casualty experiences rectal bleeding, there may be damage to the colon.

6-4. NONPENETRATING AND PENETRATING ABDOMINAL INJURIES

a. **Classification of Abdominal Injuries.** Abdominal injuries can be classified as either penetrating wounds (the skin is penetrated) or nonpenetrating blunt wounds (the skin is not penetrated).

b. **Nonpenetrating (Blunt) Injuries.** These injuries are caused by a heavy blow pushing the contents of the abdomen up against the spine. Blunt injuries damage the abdominal body wall and are equally tender whether muscles are tight or relaxed. If the abdominal cavity is injured, it will be more tender when the abdominal muscles are relaxed. Blunt trauma is often overlooked when it is associated with other injuries.

c. **Complications Associated with Nonpenetrating (Blunt) Injuries.**

(1) Ruptured spleen. The organ most frequently injured by blunt trauma is the spleen. Signs and symptoms include:

(a) A history of trauma.

(b) Pain in the left upper quadrant (LUQ).

(c) Referred pain in the top left shoulder.

(d) Hypovolemia (abnormally decreased amount of blood circulating in the body).

(e) Lower left rib fracture.

(2) Lacerated liver. Signs and symptoms of this condition include:

(a) Pain and tenderness in the right upper quadrant (RUQ).

(b) Jaundice (a yellowing of the skin due to disturbed functioning of the liver).

(c) Referred pain in the right top shoulder due to nerves that service the shoulder.

(d) Hypovolemia progressing to shock since the liver is an organ with many blood vessels.

(3) Peritonitis. This condition is inflammation of the peritoneum. Leakage from a ruptured gallbladder may be a sign that the casualty has peritonitis.

(4) Duodenum and pancreas. An injured duodenum and pancreas are usually associated with another organ's involvement with injury. Look for the following:

(a) Epigastric pain.

(b) Hypovolemia progressing to shock.

(c) Epigastric tenderness and/or rigidity. Rigidity is a critical sign when blunt trauma is the cause; surgery is required.

(d) Fever.

(e) High intestinal obstruction.

d. **Penetrating Injuries.** These injuries have both solid organ and hollow organ involvement. (This includes eviscerations, injuries in which the intestine protrudes through the intestinal wall.) In solid organ involvement, the liver may hemorrhage into the abdomen and lead to hypovolemic shock. The spleen may rupture which usually means that the spleen must be surgically removed. The kidneys may develop hematuria (blood in the urine). In the case of hollow organ involvement (intestinal injuries), chemical and bacterial peritonitis (inflammation of the intestine linings) may occur. Penetrating stomach wounds can cause bloody nasogastric aspirate. Blood found on rectal examination may be due to lower colon wounds.

NOTE: Subcutaneous emphysema (the presence of air or gas in the tissues under the top layer of skin is possible in the abdominal wall if there are ruptures in hollow organs.

6-5. TREATMENT FOR ABDOMINAL INJURIES

Begin treating for abdominal injuries immediately.

a. **First, Apply Emergency Medical Treatment to Sustain Life.** Check the casualty's airway, breathing, and circulation.

(1) Check the airway and at the same time assess the casualty for any cervical spine injuries. To determine whether the casualty is breathing, follow this procedure. Place your ear over the casualty's mouth and nose and look towards the casualty's chest. Your ear should be touching the casualty's nose. Look at the casualty's chest. If he is breathing, you should be able to see his chest rise and fall. Listen for the sound of breathing (air being inhaled and exhaled). Feel for the flow of air on the side of your face; the air flow is caused by the casualty exhaling. If you suspect that the casualty may have a cervical spine injury, **DO NOT move the casualty's head or neck**.

(2) Open the airway and perform artificial respiration (rescue breathing), if necessary. If your check shows that the casualty is not breathing, begin artificial respiration. There are three methods of rescue breathing: mouth-to-mouth, mouth-to-nose, and mouth-to-stoma. The most commonly used method is mouth-to-mouth. Mouth-to-nose is used when the casualty's mouth can't be opened or when the rescuer can't achieve a tight seal around the casualty's mouth. Mouth-to-stoma is used when there is an opening in the casualty's neck for breathing. Remember that mouth-to-mouth rescue breathing requires a good airseal of your mouth and the casualty's mouth in order to inflate the lungs. Here is the procedure for mouth-to- mouth rescue breathing. If you need more information, refer to Subcourse MD0571, Cardiac Impairment, and look at Lesson 3(Basic Cardiac Life Support).

(a) Pinch the casualty's nostrils shut.

(b) Open your mouth wide and take a deep breath.

(c) Place your mouth tightly over the patient's mouth. Make an airtight seal.

(d) Blow your breath into the casualty's mouth. You should see the casualty's chest rise as air fills his lungs. You should feel and hear the air as it is exhaled from the casualty's lungs.

(e) Remove your mouth and allow the casualty to exhale.

(f) Initially, repeat steps two through five four times. Do not wait for the lungs to deflate fully.

(g) Maintain a rate of 16 to 20 respirations per minutes.

(3) Check for a carotid pulse and perform cardiopulmonary resuscitation (CPR).

(a) Carotid pulse. Palpate the carotid artery for a pulse rather than trying to find a radial pulse at the wrist or a temporal pulse. The carotid arteries carry blood to the brain and the head, and a pulse can usually be felt here when other pulses have disappeared. The carotid arteries are located on each side of the neck. The pulse can be most easily felt next to the larynx (the voice box). Follow these steps to locate the carotid pulse:

1 Locate the larynx. The larynx is also called the "Adam's apple" or voice box. It is located in the front center of the neck.

2 Use the tips of your index and middle fingers.

3 Slide your fingers alongside the larynx in the groves formed by the muscles at the side of the neck.

4 Palpate the pulse. Avoid pressing too hard and compressing the artery. You will block out a weak pulse if you do this.

(b) Cardiopulmonary resuscitation (CPR). If there is no carotid pulse, begin artificial circulation (CPR) using external chest compression. Follow these steps:

1 Place the casualty on his back on a hard surface.

2 Position yourself at the left side of the casualty's chest.

3 Locate the lower half of the casualty's sternum. Avoid putting pressure on the tip of the sternum (xiphoid process).

4 Place the heel of your hand over the lower half of his sternum, keeping your fingers off the chest wall.

5 Put the heel of your second hand on top of the first, and move so that your shoulders are lengthwise over the casualty's sternum. Keep your arms straight and your elbows locked.

6 Exert a firm, heavy force downward on the chest. For adults, 80 to 120 pounds of pressure are required to depress the sternum 1 1/2 to 2 inches. By using your entire weight, you should be able to compress the casualty's chest. This compresses the heart and forces blood into the arteries.

7 Release the pressure, but do not remove your hands. Develop a rhythm by rolling your body forward to press and then back to release.

8 Continue compressions at the rate of 80 per minute. Continue until the casualty revives or until you are relieved. If another rescuer relieves you, change places with that person without interrupting the rhythm of chest compressions.

NOTE: Be sure to give two lung inflations after each 15 compressions.

9 For further information, refer to Subcourse MD0571, Cardiac Impairment, and look at Lesson 3 (Basic Cardiac Life Support).

b. **Make a Rapid Physical Assessment.** If organs are exposed, **DO NOT PUSH THEM BACK IN.** Cover exposed organs with sterile dressings. Pick up any organs which may be on the ground. Do this with a clean, dry dressing or with the cleanest available material. Put the organs on top of the casualty's stomach.

CAUTIONS: DO NOT probe, clean, or try to remove any foreign object from the stomach.

DO NOT touch with bare hands any exposed organs.

DO NOT push organs back inside the body.

c. **Check Frequently for Signs of Shock.** Shock is the body's response to inadequate circulation due to a variety of causes. Abdominal trauma is one of the causes. The signs of shock are related to the effects of inadequate circulation. The symptoms are:

(1) Skin--pale in color, clammy to the touch.

(2) Blood pressure--progressive, consistent fall in pressure (the earliest change to signify shock).

(3) Pulse--rapid (often over 120 beats per minute), thready, or quivery.

(4) Respirations--rapid and shallow, often grunting as if hungry for air.

(5) Cyanosis--blueness of fingernail beds or lips due to lack of oxygen; use the inner lip for detection in a dark-skinned person.

(6) Urine output--scanty or absent because of decreased circulation through the kidneys.

(7) Mental state--check by asking the casualty what time or day it is.

(8) Vital signs--take and record vital signs including blood pressure, pulse, and respirations. Also, ask about and record the presence, location, and severity of pain.

d. **Treat the Casualty for Shock.** Inflate the medical anti-shock trousers (MAST) if shock develops. Monitor the MAST to see if air is evacuating. Initiate IVs (at the rate necessary to keep the vein open) of colloid (Dextran Plasmanate), if possible. If colloid is not available, administer an IV using normal saline solution or Ringer's lactate solution. If shock develops, increase the rate of IV. It is preferred that two IVs be given simultaneously. Give nothing by mouth, but you may moisten the casualty's lips.

e. **Insert the Foley Catheter.** A catheter is inserted into the body to maintain a continuous free flow of urine. Foley catheters come in a variety of sizes. The size to be used depends on the physical structure of the patient. The doctor may designate the size when he writes the order for the catheter to be inserted. The Foley catheter has

two rubber tubes; the main line is identified by the openings at the tip and at the wide base on the opposite end. The second tube is connected and sealed along the side of the main tube; the end of the tube is fixed in a manner that allows it to be inflated with air or sterile liquid, causing the formation of an inflated balloon around the main tube. The balloon prevents the catheter from slipping out of the urinary tract. Refer to Subcourse MD0579, The Genitourinary System I for complete information on inserting a Foley cather in a patient, male or female.

f. **Insert a Nasogastric (NG) Tube.** Insert this tube unless you suspect a fractured cribriform plate. Confirm a cribriform plate fracture by X-ray. If there is a cribriform plate fracture, insert an orogastric tube. See lesson 5 of this subcourse for information on nasogastric intubation. Orogastric intubation is much like nasogastric intubation with the exception that the tube is passed through the casualty's mouth rather than his nose.

CAUTIONS: DO NOT have inexperienced personnel perform nasogastric intubation.

DO NOT give morphine to the casualty unless there is a long wait before the casualty can be evacuated and a medical doctor has ordered nasogastric intubation.

g. **Position the Casualty.** Place the casualty in a semi-Fowler's position. The semi-Fowler's position involves raising the casualty's head 45 degrees and raising his knees 15 degrees. Raising the casualty's knees makes him more comfortable because this reduces strain on his abdominal and leg muscles. If the casualty is not comfortable in the semi-Fowler position, place him in any other position. Be sure the position you have placed the casualty in does not cause further medical complications.

h. **Evacuate the Casualty.** Evacuate the casualty immediately at low altitude. General considerations for air transport of casualties with intra-abdominal (within the abdomen) injuries include the following:

(1) Gas in the bowel and stomach expands as the altitude increases.

(2) Vomiting can lead to fatal aspiration into the tracheo-bronchial tree. Therefore, place a nasogastric tube in the casualty before take-off. The tube should be left open so that drainage can occur freely.

(3) If a casualty has possible intra-abdominal hemorrhaging, the straining and retching associated with vomiting can cause additional hemorrhaging.

6-6. CLOSING

The patients with abdominal injuries will usually require definite surgical treatment. You can optimally prepare these patients for their surgical treatment.

Continue with Exercises

EXERCISES, LESSON 6

INSTRUCTIONS. Answer the following exercises by writing the answer in the space provided.

After you have completed all of these exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. List three common causes of abdominal injuries.

   a. _____.

   b. _____.

   c. _____.

2. In blunt trauma, the most commonly ruptured organ is _____.

3. In penetrating trauma, the most commonly ruptured organ is _____.

4. The organs which bruise easily are _____.

5. Injuries to the _____ are the most difficult to diagnose and these injuries can go undetected for days.

6. List three things you would do to evaluate the nature and extent of abdominal injuries.

   a. _____.

   b. _____.

   c. _____.

7. List four signs/symptoms of abdominal injuries.

   a. _____.

   b. _____.

   c. _____.

   d. _____.

8. You are evaluating a casualty with missile wounds in the abdominal walls. List two reasons why it is important to note the position of the casualty at the time of missile impact.

   a. _____.

   b. _____.

9. A casualty who has abdominal injuries with rectal bleeding may have damage to the _____.

10. Write the definitions of the two major classifications of abdominal trauma.

    a. Penetrating wounds = _____

    b. Nonpenetrating blunt wounds = _____.

11. List three signs/symptoms of an injured duodenum or pancreas.

    a. _____.

    b. _____.

    c. _____.

12. If there is solid organ involvement in a penetrating abdominal injury, the _____ may hemorrhage into the abdomen and lead to hypovolemic shock.

13. If there is hollow organ involvement (intestinal injuries, for example) in a penetrating abdominal injury, the _____ linings may become inflamed.

14. Subcutaneous emphysema is possible in the abdominal wall if _____ _____.

15. List two conditions that must be met in order for you to administer morphine to an abdominal trauma casualty.

    a. _____.

    b. _____.

16. Place the abdominal trauma casualty in the _____ position if that position is comfortable for him.

17. Abdominal trauma casualties must be evacuated at low altitude because of the possibility of _____.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 6

1. Automobile accidents.
   Gunshot wounds.
   Stabbings to the abdomen. (para 6-2)

2. The spleen. (para 6-2a)

3. The liver. (para 6-2a)

4. The kidneys. (para 6-2a)

5. Intestines. (para 6-2a)

6. You are correct if you listed any three of the following:

   Determine if the casualty has pain, is nauseated, or is vomiting.
   Check the casualty for wounds, bruises, old scars, and abrasions.
   Listen to each quadrant of the abdomen with a stethoscope.
   Palpate the abdomen making sure you carefully palpate the area of pain last.
   (para 6-3a)

7. You are correct if you listed any four of the following:

   Localized or generalized pain.
   Blood in emesis.
   Abdomen rigid when palpated.
   Pain caused by light pressure.
   Signs of shock when there is no apparent hemorrhage.
   Distention.
   Pain referred up either shoulder.
   Escape of fluid of urine or blood under the skin.
   Jaundice; unusual masses.
   Lack of bowel sounds. (para 6-3b)

8. High velocity missiles can cause extensive internal damage.
   Bullets can tumble around organs and bounce off bones. (para 6-3c)

9. Colon. (para 6-3c)

10. Penetrating wounds= wounds in which the skin is penetrated or broken.
    Nonpenetrating blunt wounds = wounds in which the skin is not penetrated or broken. (para 6-4)

11. You are correct if you listed any three of the following:

    Epigastric pain.
    Hypovolemia progressing to shock.
    Epigastric tenderness and/or rigidity.
    Fever.
    High intestinal obstruction. (para 6-4c(4))

12. Liver. (para 6-4d)

13. Intestinal. (para 6-4d)

14. There are hollow organ ruptures. (para 6-4d, NOTE)

15. Evacuation prolonged.
    Ordered by medical doctor. (para 6-5f, CAUTION)

16. Semi-Fowler's. (para 6-5g)

17. Gas in the bowel and stomach. This gas would expand as the altitude increased. (para 6-5h)

End of Lesson 6

LESSON ASSIGNMENT

LESSON 7	Hepatitis.
LESSON ASSIGNMENT	Paragraphs 7-1 through 7-11.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

7-1. Identify the common types of hepatitis.

7-2. Identify the causes of different types of hepatitis.

7-3. Identify the modes of transmission for various types of hepatitis.

7-4. Identify the signs/symptoms for specific types of hepatitis.

7-5. Identify measures for preventing hepatitis.

7-6. Identify the characteristics of variants of acute viral hepatitis.

7-7. Determine the difference between chronic persistent hepatitis and chronic active hepatitis.

SUGGESTION After completing the assignment, complete the exercises of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 7

HEPATITIS

7-1. INTRODUCTION

Hepatitis is an inflammation of the liver. From a public health point of view, the concern is that the disease is easily transmitted, and the death rate can be high. From a socioeconomic point of view, hepatitis can cause soldiers to lose time from work or training. Causes of hepatitis include viruses, drugs, and chemicals including alcohol. A primary concern of the Medical NCO should be prevention of hepatitis transmission and loss of personnel due to the disease. Your goal must be to educate soldiers about how to prevent getting the disease, but you must also know how to treat hepatitis.

7-2. COMMON TYPES OF HEPATITIS

There are four common types of hepatitis: type A hepatitis, type B hepatitis, non-A, non-B (NANB) hepatitis, and chronic hepatitis. Type A hepatitis was formerly called infectious hepatitis and short- incubation hepatitis. In the past, type B hepatitis was known as serum hepatitis, post-transfusion hepatitis, or long-incubation hepatitis. Non-A, non-B (NANB) hepatitis cannot be traced to either type A hepatitis or type B hepatitis. Little is known about the virus which causes NANB. Biologically and clinically, this virus appears similar to type B hepatitis. Chronic hepatitis is made up of a number of liver disorders that seem to be acute hepatitis on one hand but also cirrhosis on the other hand. See paragraph 7-10 for more information on chronic hepatitis.

7-3. CAUSE OF HEPATITIS

At least three distinct viruses are responsible for hepatitis: hepatitis A virus, hepatitis B virus, and hepatitis NANB. Actually, NANB hepatitis may be caused by more than one virus.

NOTE: Liver infections caused by other specific viruses, viruses such as the cytomegalovirus and the yellow fever virus, will not be discussed here.

7-4. METHODS OF TRANSMISSION OF HEPATITIS

a. **Type A Hepatitis.** The agent which causes this type of hepatitis is a filtrable virus; that is, a virus which is small enough to pass through a porcelain filter. There are several modes of transmission: the fecal-oral route; contaminated food (particularly milk or shellfish); polluted water; and, in a few sporadic cases, person-to-person contact.

b. **Type B Hepatitis.** The causative agents of this type of hepatitis are a filtrable virus and the Australia antigen (1963-Blumberg). The mode of transmission is both parenteral (intravenously here) and nonparenteral. Parenterally, the patient can become infected by a blood transfusion from an infected person, a contaminated needle, or a contaminated syringe. Another method of parenteral transmission is through skin puncture caused, for instance, by an infected medical or dental instrument. Nonparenteral transmission can occur between sexual partners. The infection rate for type B hepatitis is far lower than for type A hepatitis; however, type B hepatitis is more dangerous than type A because type B can result in massive liver destruction, chronic hepatitis, coma, and even death.

c. **Non-A/Non-B (NANB) Hepatitis.** Very little is known about the agents which cause NANB hepatitis. These agents may be transmitted parenterally. The viruses may be transmitted by individuals who are chronic carriers; that is, persons who carry the infection but are not actively ill themselves. Those countries where human waste is used as fertilizer have a high rate of carriers of NANB hepatitis. Generally, NANB hepatitis is very much like type B hepatitis.

7-5. SIGNS/SYMPTOMS OF HEPATITIS

a. **General Information.** Signs and symptoms vary from a minor flu-like illness to a sudden, fatal liver failure. Much depends on the patient's immune response.

b. **Prodromal Phase.** The early phase of the disease may begin suddenly with the following:

(1) Anorexia.

(2) Malaise.

(3) Nausea and vomiting.

(4) Fever.

(5) Urticarial eruptions (itchy hives) and arthralgias (pain in joints) may occur, especially in Type B hepatitis infection.

c. **Icteric Phase.** This phase begins three to ten days after the initial symptoms. Signs and symptoms include:

(1) Dark urine.

(2) Jaundice.

(3) Symptoms which have occurred throughout the patient's body become less severe causing the patient to feel better in spite of the jaundice.

7-6. PROGNOSIS

Hepatitis is a self-limiting disease, and the majority of patients recover spontaneously. The total illness usually lasts four to eight weeks. A favorable prognosis in hepatitis B is less certain than in hepatitis A.

7-7. TREATMENT

If you suspect that a soldier has hepatitis, refer him to a higher medical treatment facility. Hepatitis patients are normally hospitalized and become a loss to the unit. They are usually not confined to bed and normally not given special treatment. Since these patients become fatigued easily, a high carbohydrate diet is recommended for them.

7-8. PREVENTIVE MEASURES

There are a variety of measures that can be taken to prevent the spread of hepatitis. Note the following:

a. **Personal Hygiene.** Good personal hygiene helps prevent the spread of hepatitis A. Medics should be sure that field sanitation standards are adhered to in a field environment. Good standards for latrines, mess facilities, and personal hygiene should be adhered to.

b. **Field-Standard References.** Use FM 21-10 and TM 8-9 as references for field standards.

c. **Hepatitis Patients' Blood.** Blood of patients with acute hepatitis must be handled with care. Use gloves when drawing such blood from a known or suspected hepatitis carrier. Label any specimen collected as "hepatitis." Use disposable equipment and discard it properly.

d. **Secretion Contact.** Avoid contact with body secretions from known or suspected hepatitis carriers.

e. **Infectious Stools.** Stools from patients with type A hepatitis are considered infectious. Normally, the infectious period ends when the patient's liver function tests are normal and he is discharged from the hospital. During the infectious period, however, the hepatitis patient must have separate latrine facilities. Instruct him to wash his hands after each use of the latrine.

f. **Isolation of Patient.** Isolating the hepatitis patient has been overemphasized. Isolation does little to prevent the spread of type A hepatitis and is of no value in preventing the spread of type B or NANB hepatitis.

g. **Transfusions.** Avoid unnecessary transfusions for the hepatitis patient. Post- transfusion infections are possible and should be avoided.

h. **Blood Donors.** Use volunteer rather than paid blood donors. Screen prospective donors for hepatitis B surface antigen and Australia antigen (HBsAg).

i. **Vaccinations.** There is a vaccine to protect against type B hepatitis. Immune globulins offer some protection against type A hepatitis. The protection in both instances is usually less than three months.

7-9. VARIANTS OF ACUTE VIRAL HEPATITIS

a. **Anicteric Hepatitis.** This is a minor flu-like illness without jaundice. It may be only a clinical manifestation of acute hepatitis, especially in children.

b. **Recrudescent Hepatitis.** This type of hepatitis occurs in a small number of hepatitis patients during the recovery phase of their illness. Generally, patients recover well from recrudescent hepatitis. Rarely, the patient develops chronic hepatitis afterward.

c. **Fulminant Hepatitis.** This type of hepatitis is a rare syndrome usually seen in type B hepatitis, NANB hepatitis, or drug injury hepatitis. The patient experiences rapid clinical deterioration. Adults do not usually survive despite heroic measures. Children have a better chance for survival. Meticulous nursing care and careful management of specific complications provide the best hope for recovery. Remarkably, those who do survive this disease recover completely. Cases of fulminant hepatitis have been documented in Korea.

7-10. CHRONIC HEPATITIS

Chronic hepatitis is the term for a spectrum of disorders which merge into acute hepatitis or cirrhosis of the liver. Acute hepatitis includes chronic persistent hepatitis and chronic active (aggressive) hepatitis.

a. **Chronic Persistent Hepatitis.** This form of hepatitis is a benign disorder which a patient may get after having had typical acute hepatitis. The disease may last for at least six months. Most patients recover. The disease is often detected in young drug abusers. Treatment is not necessary. Neither diet nor activity needs to be restricted.

b. **Chronic Active (Aggressive) Hepatitis.**

(1) Etiology. This is a serious disorder which can be thought of as a group of closely related conditions rather than one disease. This form of hepatitis frequently results in cirrhosis of the liver and/or liver failure. In most patients, the cause is unknown. It is known, however, that type B hepatitis virus causes a small number of chronic active hepatitis cases. Drugs such as methyldopa and isoniazid (INH) are occasionally responsible for this type of hepatitis.

(2) Clinical features. About one-third of the cases of chronic active hepatitis follow the patient having had acute hepatitis. The disease usually develops gradually. The patient may have a kind of nonspecific feeling of not being well. He may be anorexic and fatigued. Sometimes jaundice is present but not always. Signs of chronic liver disease usually develop and include the following:

(a) Splenomegaly (spleen enlargement).

(b) Spider nevi (an enlarged arteriole in the skin spreading out like the legs of a spider).

(c) Fluid retention.

(3) Treatment. Included are the following:

(a) Stop the patient taking any drugs which could cause the disease.

(b) Manage any complications which the patient is experiencing.

(c) Corticosterioids may be given.

(4) Prognosis. The prognosis varies. When the disease is caused by drugs, signs and symptoms of this type of hepatitis may become less severe. With adequate therapy, the patient usually lives several years.

7-11. CLOSING

This lesson has addressed the various types of hepatitis. It is important to identify hepatitis, but it is of greater importance to know the measures which can be taken to prevent the spread of this disease.

Continue with Exercises

EXERCISES, LESSON 7

INSTRUCTIONS. Answer the following exercises by writing the answer in the space provided.

After you have completed all of these exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. Hepatitis may be defined as _____

   _____.

2. List the four common types of hepatitis.

   a. _____.

   b. _____.

   c. _____.

   d. _____.

3. Which of the types of hepatitis you listed in exercise 2 may be caused by more than one virus? _____.

4. List three ways type A hepatitis can be transmitted.

   a. _____.

   b. _____.

   c. _____.

5. A contaminated needle/syringe or skin puncture by an infected medical or dental instrument are parenteral methods of transmitting _____ hepatitis.

6. List three signs/symptoms of the prodromal phase of hepatitis.

   a. _____.

   b. _____.

   c. _____.

7. Signs/symptoms of the icteric phase of hepatitis include dark u_____ and j_____.

8. Hepatitis, a self-limiting disease, usually lasts _____ (length of time).

9. What do you do if you suspect a soldier has hepatitis? _____

   _____

10. Encouraging the practice of good personal hygiene, handling with care blood from hepatitis patients, and ensuring that hepatitis patients have separate latrine facilities are ways of _____.

11. _____ hepatitis is a minor flu-like illness without jaundice.

12. The term for a spectrum of disorders which merge into acute hepatitis or cirrhosis of the liver is _____ hepatitis.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 7

1. Inflammation of the liver. (para 7-1)

2. Type A hepatitis.
   Type B hepatitis.
   Non-A, non-B (NANB0 hepatitis.
   Chronic hepatitis. (para 7-2)

3. NANB. (para 7-3)

4. You are correct if you listed any three of the following:

   Fecal oral route.
   Contaminated food.
   Polluted water.
   Person-to-person contact. (para 7-4a)

5. Type B. (para 7-4b

6. You are correct if you listed any three of the following:

   Anorexia.
   Malaise.
   Nausea.
   Vomiting.
   Fever.
   Hives. (para 7-5b)

7. Urine.
   Jaundice. (paras 7-5c(1) and (2))

8. Four to eight weeks. (para 7-6)

9. Refer the soldier to a higher medical treatment facility. (para 7-7)

10. Preventing the spread of hepatitis. (paras 7-8a through i)

11. Anicteric. (para 7-9a)

12. Chronic. (para 7-10)

End of Lesson 7